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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:

Stewart COLE et al.

Application No.: 10/802,796

Filed: March 18, 2004

For: A METHOD FOR ISOLATING A
POLYNUCLEOTIDE OF INTEREST
FROM THE GENOME OF A MYCO-
BACTERIUM USING A BAC-BASED DNA
LIBRARY, APPLICATION TO THE
DETECTION OF MYCOBACTERIA

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) Group Art Unit: 1654
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) Examiner: Julie HA
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) Confirmation No.: 6307
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Commissioner for Patents

P.O. Box 1450

Alexandria, VA 22313-1450

Sir:

REPLY BRIEF UNDER 37 C.F.R. § 41.41

Pursuant to 37 C.F.R. § 41.41, Appellant presents this Reply to the Examiner's Answer dated September 29, 2008. A Request for Oral Hearing is concurrently filed with this Reply Brief.

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III. Statement of Additional Facts

1. The Examiner alleges that Appellant improperly attempts to use speculative language, such as "may be," "could be," and "can be" to establish substantial utility for the claimed polypeptides. (Examiner's Answer, p. 7.)

2. The American Heritage College Dictionary defines the auxiliary verb "can" as indicating physical or mental power, possession of a specified power, or possession of a specified capability. (American Heritage College Dictionary, 3rd ed., 2000, p. 203.)

3. The American Heritage College Dictionary defines "could" as the past tense of "can." (*Id.*, p. 315.)

4. The American Heritage College Dictionary defines "may" as meaning to be allowed or permitted to. (*Id.*, p. 839.)

5. The Examiner alleges that the specification discloses a gene probe without a specific target. (Examiner's Answer, p. 8.)

6. The claimed polypeptides are the gene products of a defined polymorphic region of the mycobacterial genome present in the genome of *M. tuberculosis* but absent from the genome of *M. bovis*. (Specification, p. 9, l. 25-27.)

7. The claimed polypeptides detect *M. tuberculosis* in subjects infected with *M. tuberculosis*. (Specification, p. 11, l. 8-9.)

8. The claimed polypeptides do not detect *M. bovis* in subjects vaccinated with *M. bovis*. (Specification, p. 11, l. 8-9.)

9. The Examiner considers the claimed polypeptides to be merely a research tool. (Examiner's Answer, p. 11.)

10. Characterizing claimed subject matter as a research tool has no bearing on its patentability. (M.P.E.P. § 2107.)

11. The claimed polypeptides can be used in conventional immunoassays to specifically detect an *M. tuberculosis* infection in the presence of antibodies to *M bovis*. (Specification, p. 9, l. 25-27.)

12. The claimed polypeptides can be used in conventional immunoassays to identify patients who can benefit from treatment for tuberculosis. (Specification, p. 11, l. 5-9).

13. The Examiner alleges that Appellant's asserted utility depends on the homology of the claimed polypeptides to GDP-D-mannose dehydratases. (Examiner's Answer, pp. 8-9.)

14. Appellants assert a utility for the claimed polypeptides, which is entirely independent of homology to GDP-D-mannose dehydratase. (Appeal Brief, p. 15.)

15. The Examiner states that Appellant's argument establishing written description support for the use of the claimed polypeptide in an immunoassay does not resolve the utility issue. (Examiner's Answer, p. 10.)

16. Appellant cited the Written Description Training Materials in support of its position that the claimed polypeptides can be used in an immunoassay because they possess antigenic properties. (Appeal Brief, p. 13.)

17. The Examiner alleges that the claimed invention lacks enablement because it is not supported by a specific and substantial utility. (Examiner's Answer, pp. 12-13.)

18. To the extent the enablement rejection is contingent on an improper utility rejection, it must be withdrawn. (M.P.E.P. § 2107.01.)

19. The Examiner alleges that the claimed polypeptides lack enablement because they might not function in the same manner as a GDP-D-mannose dehydratase. (Examiner's Answer, p. 13.)

20. Utility does not require that every stated objective of the invention be met. (*Raytheon*, 724 F. 951, 958-59.)

21. The specification enables one of ordinary skill in the art to use the claimed polypeptides to distinguish between the immune response induced

by vaccination with *M. bovis* and by infection with *M. tuberculosis*.

(Specification, p. 11, l. 6-9.)

IV. Brief Summary of the Claimed Subject Matter

The genus *Mycobacterium* comprises many species, including *M. tuberculosis*, which causes tuberculosis in humans, and *M. bovis*, which typically infects cattle. Institut Pasteur previously developed the *M. bovis* BCG vaccine by attenuating *M. bovis* to a state no longer virulent in humans. More than two billion people worldwide have been immunized with the *M. bovis* BCG vaccine. (Philipp, WJ *et al.*, p. 3135.)

Immunization with *M. bovis* and infection with *M. tuberculosis* each induce a specific immune response against their respective antigenic bacterial polypeptides. Because *M. bovis* and *M. tuberculosis* are largely homologous, many of the antibodies developed by the immunized and by the infected individuals are able to recognize both bacterial species. Vaccinated individuals, therefore, sometimes show positive results in current diagnostic tests for tuberculosis, regardless of whether or not they have actually been infected with *M. tuberculosis*.

Appellant now claims polypeptides encoded by polynucleotides found to be present in the *M. tuberculosis* genome but absent from the *M. bovis* genome. These polypeptides can be used in diagnostic tests to determine

whether antibodies specific for *M. tuberculosis* are present in the sample. If the claimed polypeptides react with antibodies in a test sample, the antibodies are then determined to have been specifically produced in response to infection with *M. tuberculosis*, because immunization with *M. bovis* does not induce antibodies to these polypeptides, which are not encoded by the *M. bovis* genome. Testing for immunoreactivity to one or more of the claimed polypeptides can, therefore, improve current diagnostic methods by distinguishing individuals pathologically infected with *M. tuberculosis* from those intentionally vaccinated with *M. bovis*.

V. Argument

A. The Alleged Speculative Language Conveys the Ability of the Claimed Polypeptides to Function as Described

On page 7, lines 6-8, of the Examiner's Answer, the Examiner cites the M.P.E.P. as requiring that the application be useful in its current form. "[A]n application must show that an invention is useful to the public as disclosed in its current form, not that it may prove useful at some future date after further research . . . an asserted use must show that the claimed invention has a significant and presently available benefit to the public." (M.P.E.P. § 2107.01.) The Examiner alleges that Appellant improperly attempts to use

speculative language, such as "may be," "could be," and "can be" to establish substantial utility for the claimed polypeptides.

Reply

Appellant does not rely on speculative language to establish utility. The words defined as speculative by the Examiner convey the polypeptides' ability to function in the manner described by the specification, at the present time.

The American Heritage College Dictionary defines the auxiliary verb "can" as an indication of physical or mental power, possession of a specified power, or possession of a specified capability. (American Heritage College Dictionary, 3rd ed., 2000, p. 203.) Thus, by stating that "this polymorphism can be used to distinguish *M. bovis* from *M. tuberculosis*," Appellant discloses that the isolated polymorphic 12.7 kb fragment possesses the ability to distinguish the two mycobacterial strains. (Specification, p. 37, l. 18-19.)

This dictionary defines "could" as the past tense of "can," and is used to indicate past ability. (American Heritage College Dictionary, 3rd ed., 2000, p. 315.) By stating that "it could be possible to develop a test that can reliably distinguish between the immune response induced by vaccination with *M. bovis* BCG vaccine strains and infection with *M. tuberculosis*,"

Appellant discloses that the claimed polypeptides possess the ability to distinguish between these two types of immune responses. (Specification, p. 11, l. 6-9.)

The American Heritage College Dictionary defines "may" as meaning "to be allowed or permitted to." (American Heritage College Dictionary, 3rd ed., 2000, p. 839.) By stating that "Such a polynucleotide of interest may be used as a probe or a primer useful for specifically detecting a given mycobacterium of interest," Appellant discloses that the polynucleotide is allowed, or permitted, to detect a *Mycobacterium* of interest. (Specification, p. 10, l. 26-28.)

The language from Appellant's specification is not at all speculative. It identifies a utility in positive and unequivocal terms.

B. *M. Tuberculosis* Infection is the Specific Diagnostic Target of the Claimed Polypeptides

On page 8, lines 5-11, of the Examiner's Answer, the Examiner alleges that the specification does not establish a specific utility for the condition being diagnosed or probed for. "Appellant has not clearly defined or disclosed the specific target the polypeptides are used for."

Reply

The specification establishes a specific utility for the polypeptides in diagnosing and/or probing for a tuberculosis infection. The claimed polypeptides detect *M. tuberculosis* in subjects infected with the bacterium, and distinguish the infected subjects from those who were vaccinated with the *M. bovis* BCG vaccine, but who do not have tuberculosis.

The ability to distinguish between vaccinated and infected subjects is directly related to the defined 12.7 kb polymorphic region of the mycobacterial genome present in *M. tuberculosis*, but not *M. bovis*. The claimed polypeptides are gene products from this region. It is precisely these polypeptides that are useful in tests for distinguishing *M. tuberculosis* in a sample, which also comprises *M. bovis*. The claimed polypeptides can, for example, be used in diagnostic immunoassays to distinguish a sample containing antibodies from a patient infected with *M. tuberculosis* from a sample containing antibodies from a subject vaccinated with an *M. bovis* vaccine. (Reply to Final Office Action, p. 2; Appeal Brief, p. 16.)

The specification establishes this specific utility. First, the specification states that, while mycobacterial strains are globally highly conserved across the genome, they can be distinguished by a 12.7 kb segment present in *M. tuberculosis*, but absent from *M. bovis*. (Specification, p. 6, l. 28-29; p. 7, l.

22-24.) Second, it establishes that the claimed polypeptides are gene products from this region. The claimed polypeptides are a group of nested polypeptides encoded by the polynucleotides of SEQ ID NO:1, the polymorphic 12.7 kb segment. (Specification, p. 12, l. 8 to p. 9, l. 5.) Third, it discloses that the claimed polypeptides can be used in diagnostic immunoassays. The invention provides "a test that can reliably distinguish between the immune response induced by vaccination with *M. bovis* BCG vaccine strains and infection with *M. tuberculosis*." (Specification, p. 11, l. 7-9.)

Contrary to the Examiner's assertion, the specific target for the polypeptides is clearly disclosed and defined.

C. No Additional Research is Necessary to Establish a Specific and Substantial Utility for the Claimed Polypeptides

On page 11, lines 13-18, of the Examiner's Answer, the Examiner states that the claimed polypeptides "are nothing more than a research tool," and that further research is required to establish a substantial and specific utility. This research is allegedly required to understand whether or not the polypeptide has a function and, if so, to identify that function.

Reply

A research tool is a device used to perform scientific inquiry or study. The Office cautions that an assessment focusing on whether an invention is useful only in a research setting does not address whether the invention meets the utility requirement for patentability. "Office personnel must distinguish between inventions that have a specifically identified substantial utility and inventions whose asserted utility requires further research to identify or reasonably confirm. Labels such as "research tool . . . are not helpful in determining if an applicant has identified a specific and substantial utility for the invention." (M.P.E.P. § 2107.01). The Examiner's characterization of the claimed polypeptides as "research tools" has no bearing on their patentability.

No further research is required to establish either a specific or a substantial utility for the claimed polypeptides. They define the precise region of the mycobacterial genome expressed by *M. tuberculosis*, but not by *M. bovis*, and, by defining the difference between these two strains, provide clinical guidance for treating tuberculosis.

The claimed polypeptides can function in their present form to distinguish between *M. tuberculosis* and *M. bovis*. This function is particular to the claimed subject matter and is not applicable to a broad class of

peptides. (Utility Examination Guidelines, p. 1097.) Appellant is not asserting that the claimed polypeptides merely find general use as a "probe." To the contrary, they can be used in a way that other polypeptides cannot, particularly to distinguish subjects infected with *M. tuberculosis* from those vaccinated with *M. bovis*. The claimed polypeptides are encoded by the polymorphic region of the mycobacterial genome, which is present in one strain but not in the other. It is precisely these polypeptides that define the difference between the two strains.

Methods for detecting interactions between polypeptides and antibodies are well-known in the art. In a conventional immunoassay designed to distinguish *M. tuberculosis* from *M. bovis*, samples from subjects suspected of having tuberculosis are placed in contact with one or more of the claimed polypeptides. If the subject has a tuberculosis infection, the sample will contain antibodies specific to one or more of the claimed polypeptides. Those antibodies will specifically bind to their polypeptide antigens, and can be detected using detection methods well known in the art. A sample from a subject vaccinated with *M. bovis* will contain antibodies to *M. bovis* polypeptides, but not to the claimed polypeptides, and no antibody/antigen reaction will be detected.

The claimed polypeptides also meet the criteria for substantial utility by marking a segment of the mycobacterial genome possessing a known real world use, e.g., a segment corresponding to a disease gene. "An isolated and purified DNA molecule may meet the statutory utility requirement if, e.g., it . . . serves as a marker for a disease gene." (Utility Examination Guidelines, p. 1095). The claimed polypeptides have the substantial, real world utility of identifying tuberculosis in an infected individual. A clinician can use the claimed polypeptides in deciding how to treat individual patients. The distinction between mycobacterial strains informs clinicians in their choice of pharmacologic treatment protocols, by identifying patients who would benefit from therapy directed to the pathogenic *M. tuberculosis* and by sparing patients who do not require such therapy.

**D. The Asserted Utility Is Independent of
Homology to GDP-D-Mannose Dehydratases**

In the paragraph spanning pages 8 and 9 of the Examiner's Answer, the Examiner alleges that the specification does not disclose the actual function of the claimed purified polypeptides. Citing paragraphs 63 and 238 of the specification, the Examiner notes that one of the open reading frames of the 12.7 kb polymorphic region encodes a polypeptide with 52% homology to the known protein GDP-D-mannose dehydratase, but that 52% homology

is insufficient to determine whether the claimed peptide would have a similar function. "Since the structure of the polypeptide is critical to the function of the . . . polypeptide, the asserted utility is not independent of any homology to GDP-D-mannose dehydratases. Without the polypeptide function, there is no utility." (Examiner's Answer, p. 9, l. 12-13.)

Reply

The asserted utility is independent of any homology to GDP-D-mannose dehydratases. This utility derives from the selective presence of one or more of the claimed polypeptides in one strain of *Mycobacterium* compared to another strain, and the ability of a conventional assay to distinguish antibodies produced by a tuberculosis infection from antibodies produced as a result of an immunization.

"An applicant need only make one credible assertion of specific utility for the claimed invention to satisfy 35 U.S.C. § 101." (M.P.E.P. § 2107.02.) A specification needs, therefore, to disclose only one specific, substantial, and credible utility to satisfy the statute. The specification discloses that the actual function of the claimed purified polypeptides is to distinguish between the responses to these mycobacterial strains. (Specification, p. 11, l. 6-9.)

By asserting one specific, substantial, and credible utility, Appellant has established the utility of the invention as a whole. (In re Gottlieb,

328 F.2d 1016,1019, 140 U.S.P.Q. 665, 668 (C.C.P.A. 1964).) ("Having found that the antibiotic is useful for *some* purpose, it becomes unnecessary to decide whether it is in fact useful for the other purposes 'indicated' in the specification as possibly useful.") Utility does not require that every stated objective of the invention be met. All that is required is that the claimed invention meets at least one stated objective. (*Raytheon Co. v. Roper Corp.*, 724 F.2d 951, 958-59, U.S.P.Q. 592, 598 (Fed. Cir. 1983) .) ("When a properly claimed invention meets at least one stated objective, utility under § 101 is clearly shown.")

To demonstrate substantial utility, "An application must show that an invention is useful to the public as described in its current form." (M.P.E.P. § 2107.01.) Appellant has demonstrated that the claimed polypeptides meet the objective of identifying an *M. tuberculosis* infection. The polypeptides, as disclosed in the as-filed specification, can be used in conventional immunoassays, e.g., ELISA assays, which were developed in the 1970s and were well known in the art at the time the application was filed. In particular, the presence or absence of antibodies specific for the claimed polypeptides distinguishes samples from individuals pathologically infected with *M. tuberculosis* from those intentionally vaccinated with *M. bovis*. If one or more antibodies specific for the claimed polypeptides is present, the subject is

infected with *M. tuberculosis*. If not, the subject is not infected with *M. tuberculosis*, although the subject may have been previously vaccinated with *M. bovis*. This distinction provides an advantage over diagnostic tests in the prior art lacking the capability to distinguish these two mycobacterial strains.

"A patent examiner must accept a utility asserted by an applicant unless the Office has evidence or sound scientific reasoning to rebut the assertion. (Utility Examination Guidelines, p. 1096). Appellant asserts that the claimed polypeptides can identify biological samples comprising *M. tuberculosis*, regardless of whether or not they also comprise *M. bovis*. Homology to GDP-D-mannose dehydratase plays no role in the use of the claimed polypeptides to make this identification.

E. Appellant Presented a Written Description Analysis to Demonstrate that the Polypeptides, as Disclosed in Their Present Form, Can Be Used in an Immunoassay to Identify *M. Tuberculosis*

On page 10, lines 5-6 of the Examiner's Answer, the Examiner states that Appellants' argument establishing Written Description support for the use of the claimed polypeptides in an immunoassay does not resolve the utility issue, as utility and written description have separate and distinct requirements.

Reply

In the Appeal Brief, Appellant cited the Written Description Training Materials to emphasize that the specification effectively discloses an immunoassay using the claimed polypeptides. Appellant was then and is now asserting that a utility of the claimed polypeptides derives from their selective presence in one strain of *Mycobacterium* compared to another. A conventional immunoassay can distinguish the two strains by determining the presence or absence of one or more of the claimed polypeptides.

Polypeptides must be antigenic, in order to be useful in an immunoassay. Appellant established that the claimed polypeptides have antigenic properties, and, therefore can be used in an immunoassay. (Appeal Brief, p. 13; Specification, p. 11, l. 6-10.) The specification "assum[es] that some of the gene products from this region represent proteins with antigenic properties." (Specification, p. 11, l. 6-7.) The Written Description Training Materials support this assumption by teaching that proteins are good antigens. (Written Description Training Materials, p. 45; Appeal Brief, p. 13.) Therefore, the claimed polypeptides can be used in an immunoassay to indicate the presence of *M. tuberculosis*.

F. The Polypeptides Are Enabled

In the paragraph spanning pages 12 and 13 of the Examiner's Answer, the Examiner alleges that, because the claimed invention lacks utility, it is not enabled. The Examiner views the claimed polypeptides as unpredictable research tools. Citing a low homology to a particular known protein, the Examiner states that one of ordinary skill in the art would be burdened with undue experimentation, if required to study whether polypeptides of different sequences would behave similarly to the claimed polypeptides.

Reply

To the extent the enablement rejection is contingent on an improper utility rejection, it must be withdrawn:

Office personnel should not impose a 35 U.S.C. § 112, first paragraph rejection grounded on a "lack of utility" basis unless a 35 U.S.C. § 101 rejection is proper.

(M.P.E.P. § 2107.01.) This enablement rejection is contingent on the improper utility rejection, based on homology to GDP-D-mannose dehydratases. Appellant, therefore, respectfully asserts that the rejection of the pending claims, under 35 U.S.C. § 112, first paragraph, must be withdrawn concurrently with the withdrawal of the rejection under 35 U.S.C. § 101.

**G. The Examiner's New Grounds for Rejection
on the Basis of Nonenablement is Based
on a False Assumption**

On page 13, lines 5-6, of the Examiner's Answer, the Examiner alleged that, even if the claimed polypeptides have utility, they lack enablement because one of ordinary skill in the art could not determine whether or not they would behave in the same manner as GDP-D-mannose dehydratase. According to the Examiner, the claimed polypeptide having the highest homology to GDP-D-mannose dehydratase shares 52% of the sequence. "A polypeptide having such a vast sequence difference would not necessarily have the same function as the wild-type polypeptide." (Examiner's Answer, p. 13.)

Reply

This enablement rejection is based on a false assumption about the claimed polypeptides. The claimed polypeptides distinguish between the immune response induced by vaccination with *M. bovis* and infection with *M. tuberculosis*. The degree of homology between the claimed polypeptides and GDP-D-mannose dehydratases is irrelevant.

VI. Conclusion

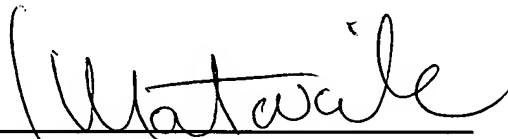
For the reasons given in this Reply Brief and of record to date, the specification meets the requirements of 35 U.S.C. § 101 by disclosing a

specific and well-established utility of the claimed polypeptides. Specifically, subjects vaccinated against tuberculosis with an *M. bovis* vaccine do not test positive in assays for the claimed polypeptides, unless they are also infected with *M. tuberculosis*. Appellant has disclosed a practical benefit, presently available to the public, and now respectfully requests that the Board reverse all grounds for rejecting the appealed claims.

Appellant encloses a check for the fee of \$540.00, as required under 37 C.F.R. § 1.17(c). If any additional fees are required, Appellant requests that they be charged to Deposit Account No. 06-0916.

FINNEGAN, HENDERSON, FARABOW,
GARRETT & DUNNER, L.L.P.

Dated: November 24, 2008

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VII. Appendix

- A. American Heritage College Dictionary, 3rd ed., 2000, pages 203, 315, and 839
- B. *In re Gottlieb*, 328 F.2d 1016, 140 U.S.P.Q. 665 (C.C.P.A. 1964)
- C. *Raytheon Co. v. Roper Corp.*, 724 F.2d 951, U.S.P.Q. 592 (Fed. Cir. 1983)

THE AMERICAN HERITAGE[®] COLLEGE DICTIONARY

THIRD EDITION



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motor vehicle used for camping and recreational travel.
b. The rear compartment or attached trailer of such a vehicle.
camp·pe·si·no (kām'pē-sē'nō, kām'pē-'nō) *n.*, *pl.* -nos. A Latin-American farmer or farm worker. [Sp. < *campu*, field < Lat. *campus*.]
camp·pes·tral (kām'pēs'tral) *adj.* Of, relating to, or growing in uncultivated land or open fields. [< Lat. *campester*, of a field < *campus*, field.]
camp·fire (kām'fīr') *n.* 1. An outdoor fire in a camp, used for cooking or warmth. 2. A meeting held around such a fire.
Camp Fire Girl *n.* A member of an organization for girls aged 7 through 18 that strives to teach good values and practical skills. [From *Camp Fire Girls*, Inc.]
camp follower *n.* A civilian who follows a military unit from place to place, esp. as a vender or a prostitute.
camp·ground (kām'grəund') *n.* An area used for setting up a camp or holding a camp meeting.
cam·phene (kām'fēn') *n.* A crystalline terpene, C₁₀H₁₆, used to make synthetic camphor and insecticides. [CAMPH(OR) + -ENE.]
cam·phor (kām'fər) *n.* An aromatic crystalline compound, C₁₀H₁₆O, obtained naturally from the camphor tree or synthesized and used in the manufacture of film and plastics and in medicine for mild pain and itching. [ME *camphre* < AN < Med.Lat. *camphora* < Ar. *kāfir*, poss. < Malay *kapur*; akin to Skt. *karpuṣa*.] — **cam·phor·a·ceous** (kām'fə-rā'shəs) *adj.* — **cam·phor·ic** (fōr'fīk, -fōr'fē) *adj.*
cam·phor·ate (kām'fə-rāt') *tr.v.* -at·ed, -at·ing, -ates. To treat or impregnate with camphor.
camphor oil *n.* The oil obtained by steam distillation from the wood of the camphor tree and used to produce natural camphor.
camphor tree *n.* An east Asian evergreen tree (*Cinnamomum camphora*) having wood and leathery leaves that are a source of camphor.
Cam·pi·na Gran·de (kām'pē-nā grān'dā, -dē, kās-pē'nā grān'dā). A city of extreme E. Brazil NW of Recife. Pop. 222,102.
Cam·pi·nas (kām'pē'nās, kās-nā). A city of SE Brazil NNW of São Paulo. Pop. 566,627.
cam·pi·on (kām'pē-on) *n.* Any of several plants of the genera *Lychnis* and *Silene*, native chiefly to the Northern Hemisphere and having notched or fringed flower petals. [?]
Cam·pi·on (kām'pē-on), Thomas. 1567–1620. English poet and composer of songs for voice and lute.
camp meeting *n.* An evangelistic gathering held in a tent or outdoors and often lasting several days.
cam·po (kām'pō, kām'pē-) *n.*, *pl.* -pos. A large grassy plain in South America, with scattered bushes and small trees. [Sp., field < Lat. *campus*.]
Cam·po·bel·lo Island (kām'pə-bē'lō). An island of SW New Brunswick, Canada, off the coast of ME.
Cam·po Gran·de (kām'pō grān'dā, -dē, kās'pō grān'dā). A city of SW Brazil WNW of São Paulo. Pop. 282,857.
camp·o·ree (kām'pə-rē') *n.* A local gathering of Boy Scouts or Girl Scouts. [Prob. CAMP + (JAMB)OREE.]
Cam·pos (kām'pas, kās'pōs). A city of SE Brazil NE of Rio de Janeiro; founded in the 17th cent. Pop. 178,457.
camp robber *n.* See gray jay.
camp·site (kām'pī'tī') *n.* An area for camping.
Camp Springs. A city of W-central Maryland, a suburb of Washington DC. Pop. 16,392.
cam·pus (kām'pas) *n.*, *pl.* -pus·es. The grounds of a school, college, university, or hospital. [Lat., field.]
cam·py·lo·bac·ter·o·sis (kām'pə-lō-bāk'tə-rō'sīs) *n.* A gastrointestinal condition characterized by diarrhea, abdominal cramps, and fever, caused by eating raw meat or unpasteurized milk contaminated with *Campylobacter jejuni*. [NLat. *Campylobacter*, genus name (Gk. *kampylos*, curved + *bacter* (ium)) + -OSIS.]
cam·py·lot·ro·pous (kām'pə-lōt'rō-pəs) *adj.* Bot. Having a partially inverted ovule such that the micropyle nearly meets the funiculus. [Gk. *kampylos*, curved + -TROPICUS.]
cam·shaft (kām'shāft') *n.* An engine shaft fitted with a cam or cams.
Ca·mus (kā-mōō', -mū'), Albert. 1913–60. French existentialist who won the 1957 Nobel Prize for literature.
can (kān; kan *when unstressed*) *aux.v.* Past tense could (kōōd).
1.a. Used to indicate physical or mental ability: *I can lift it.*
b. Used to indicate possession of a specified power, right, or privilege: *We can vote.* *c.* Used to indicate possession of a specified capability or skill: *I can sing.* **2.a.** Used to indicate possibility or probability: *Such things can happen.* **b.** Used to indicate that which is permitted, as by conscience or feelings: *One can hardly blame you.* *c.* Used to indicate probability or possibility under the specified circumstances: *They can hardly have intended that.* **3. Usage Problem.** Used to request or grant permission: *Can I be excused?* [ME, first and third pers. sing. pr.t. of *connen*, to know how < OE *cunnan*. See *gnō*·.]
Usage Note: Generations of grammarians and schoolteachers have insisted that *can* should be used only to express the capacity to do something and that *may* must be used to

express permission. Technically, correct usage therefore requires *May* (not *can*) *I take another week to submit the application?* Only 21 percent of the Usage Panel accepts *can* in this sentence. *Can* does have a long history of use by educated speakers to express permission, particularly in British English. But observance of the distinction is often advisable in the interests of clarity.

can² (kān) *n.* 1. A usu. cylindrical metal container. **2.a.** An airtight container, usu. made of tin-coated iron, in which foods or beverages are preserved. **b.** The contents of such a container. **3.** Slang. A jail or prison. **4.** Slang. A toilet or restroom. **5.** Slang. The buttocks. — *tr.v.* **canned, can·ning, cans.** 1. To seal (food) in an airtight container for future use; preserve. **2.** Slang. To make a recording of. **3.** Slang. To dismiss from employment or school. **4.** Slang. To put a stop to; quit: *Let's can the chatter.* [ME *canne*, a water container < OE.] — **can·ner** *n.*

can. abbr. 1.a. Canceled. b. Cancellation. 2. Cannon. 3. Canon. 4. Canto.

Can. abbr. 1. Canada. 2. Canadian.

Ca·na (kā'nā). A village of N Palestine near Nazareth where Jesus performed his first miracle, changing water into wine.

Ca·naan (kā'nān). An ancient region made up of Palestine and the part of it between the Jordan R. and the Mediterranean.

Ca·naan·ite (kā'nā-nī'tē) *n.* 1. A member of a Semitic people who inhabited Canaan from late prehistoric times and were conquered by the Israelites around 1000 B.C. 2. The Semitic language of the Canaanites. — *adj.* Of or relating to ancient Canaan or its people, language, or culture.

Can·a·da (kā'nā-dā). A country of N North America; settled by English and French colonists and ceded to England in 1763. The Dominion of Canada was formed in 1867. Cap. Ottawa. Pop. 23,343,181. — **Ca·na·di·an** (kā'nā-dē-an) *adj.* & *n.*

Canada balsam *n.* A viscous transparent resin obtained from the balsam fir and used as a cement for glass lenses and for mounting specimens on microscopic slides.

Canada Day *n.* July 1, observed in Canada in commemoration of the formation of the Dominion in 1867.

Canada goose or **Canadian goose** *n.* A common wild goose (*Branta canadensis*) of North America having grayish plumage, a black neck and head, and a white throat patch.

Canada jay *n.* See gray jay.

Canada thistle *n.* A perennial herb (*Cirsium arvense*) in the composite family, native to Europe and naturalized as a noxious weed in North America, having spiny-margined leaves.

Canadian bacon *n.* Cured rolled bacon from the loin of a pig.

Canadian Falls also **Horse·shoe Falls** (hōrs'shōō', hōrsh'-). A section, c. 48 m (158 ft) high, of Niagara Falls within Ontario, Canada.

Canadian French *n.* The French language as used in Canada.

Canadian hemlock *n.* A coniferous evergreen monoecious tree (*Tsuga canadensis*) native from Nova Scotia to Alaska and valuable for its timber, as a pulpwood, and for tanning.

Canadian River. A river rising in NE NM and flowing c. 1,458 km (906 mi) E to the Arkansas R.

Canadian Shield. See Laurentian Plateau.

ca·nal·lie (kā-nī', -nāl') *n.* 1. The masses of the people; the proletariat. 2. Rabble; riffraff. [Fr. < Ital. *canaglia*, pack of dogs, rabble < *cane*, dog < Lat. *canis*. See *kwon*·.]

ca·nal (kā-nāl') *n.* 1. An artificial waterway or artificially improved river used for travel, shipping, or irrigation. **2.** Anat. A tube, duct, or passageway. **3.** Astron. One of the faint hazy markings resembling straight lines on early telescopic images of the surface of Mars. — *tr.v.* -nal·led, -nal·ling, -nals or -naled, -nal·ing, -nals. 1. To dig a canal through. **2.** To provide with a canal. [Partly Fr., channel, and partly ME, tube (< Med.Lat. *canāle*), both < Lat. *canālis*, prob. < *canna*, small reed. See *CANE*.]

Ca·na·let·to (kā'nā-lēt'ō). 1697–1768. Italian painter noted for his detailed views of Venice.

can·a·lic·u·late (kā'nā-līk'yā-līt, -lāt') *adj.* Having one or more longitudinal grooves or channels. [Lat. *canaliculatus* < *canaliculus*, dim. of *canālis*, channel. See *CANAL*.]

can·a·lic·u·lus (kā'nā-līk'yā-ləs) *n.*, *pl.* -li (-lī'). A small canal or duct in the body. [Lat. *canaliculus*, dim. of *canālis*, conduit. See *CANAL*.] — **can·a·lic·u·lar** (-lār) *adj.*

can·a·li·za·tion (kā'nā-lī-zā-shən) *n.* 1. The act or an instance of canalizing. **2.** A system of canals.

can·a·lize (kā'nā-līz') *tr.v.* -lized, -lizing, -lizes. 1. To furnish with or convert into a canal or canals. **2.** To provide an outlet for; channel.

Ca·nal Zone (kā-nāl') also **Pan·a·ma Canal Zone** (pān'ə-mā', -mō'). A strip of land, c. 16 km (10 mi) wide, across the Isthmus of Panama; formerly administered by the U.S. and turned over to Panama in 1979.

can·a·pé (kā'nā-pā', -pē) *n.* A cracker or a small piece of bread served with a spread as an appetizer. [Fr. < *canapé*, couch < Med.Lat. *canāpium*, mosquito net. See *CANOPY*.]

ca·nard (kā-nārd') *n.* 1. An unfounded or false, deliberately misleading story. **2.a.** A short winglike control surface projecting from the fuselage of an aircraft, mounted forward of



Albert Camus
Photographed in 1956



Canada



Canada goose
Branta canadensis

ā pat	oi boy
ā pay	ou out
ār care	ōō tōōk
ā father	ōō bōōt
ē pet	ū cut
ē be	ū urge
ī pit	th thin
ī ple	th this
īr pler	hw which
ō pot	zh vision
ō toe	ə about
ō paw	item

Stress marks:

' (primary);

ˈ (secondary), as in dictionary (dīk'shə-nēr'ē)

co·tid·al (kō-tid'əl) *adj.* 1. Indicating coincidence of high tides or low tides. 2. Of or relating to a line that passes through each location on a coastal map where tides occur at the same time of day.

co·til·lion also **co·til·lon** (kō-til'yon, kə-) *n.* 1. A formal ball, esp. one at which girls are presented to society. 2. A lively dance, originating in France in the 18th century, having intricate patterns and steps. b. A quadrille. c. Music for these dances. [Fr. *cotillon* < OFr., petticoat, dim. of *cote*, coat. See *coat*.]

co·to·ne·as·ter (kō-tō-nē-ās'tər) *n.* Any of various erect or creeping shrubs of the genus *Cotoneaster* in the rose family, native to Eurasia and having tiny red or black fruits. [NLat. *Cotoneaster*, genus name: Lat. *cotōneum*, quince; see *quince* + Lat. *-aster*, partially resembling.]

Co·to·nou (kōt'no-ŋ). A city of S Benin on the Gulf of Guinea. Pop. 215,000.

Co·to·pax·i (kō'tō-pāk'sē, kō'tō-pā'hē). An active volcano, 5,900.8 m (19,347 ft), in the Andes of central Ecuador.

cot·quean (kōt'kwēn') *n.* *Archaic.* 1. A coarse or scolding woman. 2. A man concerned with domestic matters traditionally regarded as suitable for women. [cot + QUEAN.]

Cots·wold (kōt'swōld') *n.* A sheep of a breed distinguished by its long wool, originally developed in the Cotswold Hills.

Cotswold Hills. A range of SW England extending c. 80 km (50 mi) NE from Bristol and rising to approx. 329 m (1,080 ft).

cot·ta (kōt'a) *n., pl. cot·tas* (kōt'ē) or **cot·tas.** A short surplice. [Med.Lat., of Gmc. orig.]

cot·tage (kōt'ij) *n.* 1. A small single-storied house, esp. in the country. 2. A small summer house. [ME *cotage* < AN < Med.Lat. *cotāgium*, of Gmc. orig.]

cottage cheese *n.* A soft white cheese made of strained and seasoned curds of skim milk. Also called regionally *smearcase*.

Cot·tage Grove (kōt'ij). A city of E MN, a suburb of St. Paul. Pop. 22,935.

cottage industry *n.* 1. A usu. small-scale industry carried on at home or out of the home by family members using their own equipment. 2. A small, loosely organized industry.

cot·tag·er (kōt'ij-ər) *n.* One who resides in a cottage.

cottage tulip *n.* A late-blooming type of garden tulip having long stems and egg-shaped, variously colored flowers.

Cott·bus also **Kott·bus** (kōt'bas, kōt'bōs') *n.* A city of E-central Germany near the Polish border. Pop. 120,723.

cot·ter (kōt'ər) *n.* 1. A bolt, wedge, key, or pin inserted through a slot to hold parts together. 2. A cotter pin. [?]

cotter pin *n.* A split cotter inserted through holes in two or more pieces and bent at the ends to fasten the pieces together.

Cot·ti·an Alps (kōt'ē-ən). A range of the Alps between NW Italy and SE France rising to 3,843.6 m (12,602 ft).

cot·ton (kōt'n) *n.* 1. a. Any of various shrubby plants of the genus *Gossypium*, grown for the soft white downy fibers surrounding oil-rich seeds. b. The fiber of any of these plants, used in making textiles and other products. c. Thread or cloth manufactured from the fiber of these plants. 2. The crop of these plants. 3. Any of various soft downy substances produced by other plants. — *intr.v.* -toned, -ton·ing, -tons. *Informal.* 1. To take a liking; attempt to be friendly: *a dog that didn't cotton to strangers*. 2. To come to understand. Often used with *to* or *onto*. [ME *cotonum* < OFr. *coton* < OItal. *cotone* < Ar. dial. *qoton* < Ar. *qutn*.]

Cot·ton (kōt'n), John. 1584–1652. English-born Amer. cleric who fled religious persecution in England and settled in Boston, where he became a civil and religious leader.

Cotton Belt. An agricultural region of the SE U.S. extending through NC, SC, GA, AL, MS, TN, AR, LA, TX, and OK and including small sections of MO, KY, FL, and VA.

cotton candy *n.* A light, very sweet candy of threaded sugar.

cotton gin *n.* A machine that separates the seeds, seed hulls, and other small objects from the fibers of cotton.

cotton grass *n.* Any of various perennial grasslike plants of the genus *Eriophorum*, bearing at maturity one or more conspicuous tufts of cottony bristles.

cot·ton·mouth (kōt'n-mouth') *n.* See *water moccasin* 1.

cot·ton·pick·ing (kōt'n-pik'ing) *adj.* *Informal.* Used as an intensive: *a cotton-picking fool*.

cot·ton·seed (kōt'n-sēd') *n.* The seed of the cotton plant.

cottonseed oil *n.* The usu. pale yellow oil obtained from cottonseed, used in manufacturing, industry, and cooking.

cotton stainer *n.* Any of various red and black bugs of the genus *Dysdercus* that pierce cotton bolls and stain the fibers.

cot·ton·tail (kōt'n-tāl') *n.* Any of several North American rabbits of the genus *Sylvilagus*, having grayish or brownish fur and a tail with a fluffy white underside.

cot·ton·weed (kōt'n-wēd') *n.* Any of various plants having cottony down, as some species of the genus *Froelichia*.

cot·ton·wood (kōt'n-wōd') *n.* Any of several North American poplar trees, esp. *Populus deltoides*, having triangular leaves and a tuft of cottony hairs on the seeds.

cotton wool *n.* Cotton in its natural or raw state.

cot·ton·y (kōt'n-ē) *adj.* 1. Of or resembling cotton; fluffy. 2. Covered with fibers resembling cotton; nappy.

co·tur·nix (kə-rūr'nīks) *n.* A small stub-tailed Eurasian quail

(*Coturnix coturnix*) having sandy streaked plumage and commonly used in laboratory research. [Lat., quail.]

Co·ty (kō-tē', kō-), René. 1882–1962. French politician and the last president (1953–59) of the Fourth Republic.

cot·y·le·don (kōt'ī-ēd'n) *n.* 1. *Bot.* A leaf of the embryo of a seed plant, which upon germination either remains in the seed or emerges, enlarges, and becomes green. 2. *Anat.* One of the lobules constituting the uterine side of the mammalian placenta, consisting mainly of a rounded mass of villi. [Lat., navelwort < Gk. *kotylédōn* < *kotulē*, hollow object.]

— **cot·y·le·don·al**, **cot·y·le·do·nous** (-ēd'n-əs) *adj.*

cot·y·loid (kōt'ī-oid') also **cot·y·loid·al** (kōt'ī-oid'əl) *adj.* Shaped like a cup. [Gk. *kotuloeidēs*: *kotulē*, hollow object + *-eoidēs*, -oid.]

couch (kouch) *n.* 1. a. A sofa. b. A sofa on which a patient lies while undergoing psychoanalysis or psychiatric treatment. 2. a. The frame or floor on which grain, usu. barley, is spread in malting. b. A layer of grain, usu. barley, spread to germinate. 3. A priming coat of paint or varnish used in artistic painting. — *v.* **couched**, **couch·ing**, **couch·es**. — *tr.* 1. To word in a certain manner; phrase. 2. To cause (oneself) to lie down, as for rest. 3. To embroider by laying thread flat on a surface and fastening it by stitches at regular intervals. 4. To spread (grain) on a couch to germinate, as in malting. 5. To lower (a spear, for example) to horizontal position, as for an attack. — *intr.* 1. To lie down; recline, as for rest. 2. To lie in ambush or concealment; lurk. 3. To be in a heap or pile, as leaves for decomposition or fermentation. [ME *couche* < OFr. < *couchier*, to lay down, lie down < Lat. *collocare*. See *collocate*.] — **couch·er** *n.*

couch·ant (kou'chant) *adj.* *Her.* Lying down with the head raised. [ME < OFr., pr.p. of *couchier*, to lie down. See *couch*.]

cou·chette (kō-shē'tē) *n.* 1. A compartment on a European passenger train equipped with four to six berths for sleeping. 2. A sleeping berth in one of these compartments. [Fr., dim. of *couche*, bed < OFr. See *couch*.]

couch grass *n.* A Eurasian grass (*Agropyron repens*) that has whitish-yellow root stocks and has become a troublesome weed in the New World. [Alteration of *quitch grass*.]

couch potato *n.* *Slang.* A person who spends much time sitting or lying down, usu. watching television.

cou·gar (kōo'gar) *n.* See *mountain lion*. [Fr. *couguar*, alteration of Port. *çuquarana* < Tupi *suasuarana*: *suasú*, deer + *rana*, like (< its color).]

cough (kōf, kōs) *v.* **coughed**, **cough·ing**, **coughs**. — *intr.* 1. To expel air from the lungs suddenly and noisily, often to keep the respiratory passages free of irritating material. 2. To make a noise similar to a cough. — *tr.* To expel by coughing. — *n.* 1. The act of coughing. 2. An illness marked by frequent coughing. — *phrasal verb.* **cough up**. *Slang.* 1. To hand over or relinquish (money or another possession), often reluctantly. 2. To confess or disclose. [ME *coughen*, ult. of imit. orig.]

cough drop *n.* A small, often medicated and sweetened lozenge taken orally to ease coughing or soothe a sore throat.

Cough·lin (kōg'lin), Charles Edward. 1891–1979. Canadian-born Amer. priest and political activist who gained a wide audience through radio broadcasts of his sermons.

cough syrup *n.* A sweetened medicated liquid taken orally to ease coughing.

could (kōd) *aux.v.* P.t. of *can* 1. Used to indicate ability, possibility, or permission in the past: *I could run faster then. It could be no better. Only men could go to the club*. 2. Used with hypothetical or conditional force: *If we could help, we would*. 3. Used to indicate tentativeness or politeness: *I could be wrong. Could you come over here?*

could·est (kōd'ēst) or **couldst** (kōd'st) *aux.v.* *Archaic.* A second pers. sing. p.t. of *can* 1.

could·n't (kōd'n't). Could not.

cou·lee (kōo'lē) *n.* 1. *Western U.S.* A deep gulch or ravine with sloping sides, often dry in summer. 2. *Louisiana & Southern Mississippi.* a. A streambed, often dry. b. A small stream, bayou, or canal. 3. *Upper Midwest.* A valley with hills on either side. 4. a. A stream of molten lava. b. A sheet of solidified lava. [Canadian Fr. *coulée* < Fr., flow < *couler*, to flow < Lat. *colāre*, to filter < *colum*, sieve.]

cou·lisse (kōo-lēs') *n.* 1. A grooved timber in which something slides. 2. a. One of the side scenes of the stage in a theater. b. The space between the side scenes. c. A backstage area in a theater. [Fr. < OFr. (*porte*) *couleice*, sliding door. See *portcullis*.]

cou·loir (kōo-lwār') *n.* A deep mountainside gorge or gully, esp. in the Swiss Alps. [Fr. < *couler*, to slide. See *coulee*.]

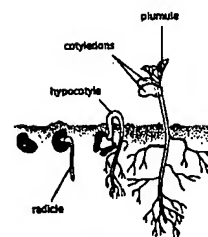
cou·lomb (kōo'lōm', -lōm') *n.* The meter-kilogram-second unit of electrical charge equal to the quantity of charge transferred in one second by a steady current of one ampere. See *table at measurement*. [After Charles Augustin de Coulomb.]

cou·lomb (kōo'lōm', -lōm') or **cou·lomb·bic** (kōo-lōm'біk, -lōm'бі-) *adj.* Of or relating to the Coulomb force.

Cou·lomb (kōo'lōm', -lōm', kōo-lōm', -lōn'), Charles Augustin de. 1736–1806. French physicist who pioneered research in magnetism and electricity.



cottonwood
Eastern cottonwood
Populus deltoides



cotyledon

ā pat	oi boy
ā pay	ou out
ār care	ōō tōōk
ā father	ōō bōōt
ē pet	ū cut
ē be	ūr urge
ī pit	th thin
ī ple	zh this
ī pter	hw which
ō pot	zh vision
ō toe	ə about
ō paw	item

Stress marks:

' (primary);

' (secondary), as in dictionary (dīk'shə-nēr'ē)

mau·gre (mô'gar) *prep.* *Archaic.* Notwithstanding. [ME < OFr.: *mal-, mau-, bad*; see *mal-* + *gre*, pleasure (< Lat. *grātum* < neut. of *grātus*, pleasing; see *g'wara-2**)]

Mau·i (mou'ē). An island of HI NW of Hawaii I.

maul also **mail** (môl) — *n.* 1. A heavy long-handled hammer used esp. to drive stakes, piles, or wedges. 2. A heavy hammer with a wedge-shaped head used for splitting logs. — *tr.v.* **mauled**, **maul·ing**, **mauls** also **mailed**, **mail·ing**, **mails**. 1. To injure by or as if by beating. 2. To handle roughly. 3. To split (wood) with a maul and wedge. [ME *malle* < OFr. *mail* < Lat. *malleus*. See *melo-**.] — **maul'er** *n.*

Maul·din (môl'dîn), William Henry ("Bill"). b. 1921. Amer. editorial cartoonist noted for his realistic, bitterly comic drawings of front-line soldiers.

maul·stick also **mahl·stick** (môl'stîk') *n.* A long wooden stick used by painters as a support for the hand that holds the brush. [Partial transl. of obsolete Du. *maaltok*: *maalen*, to paint (< MDu. *malen*) < *stok*, stick.]

Mau·na Ke·a (mou'na kâ'ā, mô'na kē'ā). An active volcano, c. 4,208 m (13,796 ft), of N-central Hawaii I.

Mauna Lo·a (lô'ā). An active volcano, 4,172.4 m (13,680 ft), of S-central Hawaii I.

maund (mônd) *n.* A unit of weight varying in different countries of Asia from 11.2 to 37.4 kilograms (24.8 to 82.6 pounds) avoirdupois, the latter being the official maund in India. [Hindi *mān* < Skt. *mānam*, measure.]

maun·der (môn'dar, mân'-) *intr.v.* **-dered**, **-der·ing**, **-ders**. 1. To talk incoherently or aimlessly. 2. To move or act aimlessly or vaguely; wander. [?]

Maun·dy Thursday (môn'dē, mân'-) *n.* The Thursday before Easter, commemorating the Last Supper. [< ME *maunde*, foot-washing ceremony on this day < OFr. *mande* < Lat. (*novum*) *mandatum*, (new) commandment (< Jesus's words in John 13:34). See *MANDATE*.]

Mau·pas·sant (mô'pā-sānt', mō-pā-sān'), (Henri René Albert) Guy de. 1850–93. French writer known esp. for his realistic short stories, such as "The Necklace."

Mau·re·ta·ni·a (môr'tā'nē-ā, -tān'ya, mār'-). An ancient district of the Roman Empire in present-day Morocco and Algeria; ruled by Rome from c. 100 B.C. to the 5th cent. A.D. — **Mau·re·ta·ni·an** *adj.* & *n.*

Mau·riac (môr'ē-āk', môr-yāk'), François. 1885–1970. French writer who won the 1952 Nobel Prize for literature.

Mau·rice of Nas·sau (môr'tis, môr'-; nās'ō). Prince of Orange. 1567–1625. Dutch general who drove Spanish forces from Dutch territory (1590–1609).

Mau·ri·ta·ni·a (môr'tā'nē-ā, -tān'ya, mār'-). A country of NW Africa bordering on the Atlantic; achieved independence from France in 1960. Cap. Nouakchott. Pop. 1,727,000. — **Mau·ri·ta·ni·an** *adj.* & *n.*

Mau·ri·tius (mô-rîsh'as, -ē-as). An island country in the SW Indian Ocean comprising the island of Mauritius and small dependencies in the Mascarene Is.; achieved independence from Great Britain in 1968. Cap. Port Louis. Pop. 1,023,934. — **Mau·ri·tian** *adj.* & *n.*

Mau·rois (môr-wā'), André. Émile Herzog. 1885–1967. French writer noted for his essays, biographies, and novels.

Mau·ry (môr'ē), Matthew Fontaine. 1806–73. Amer. naval officer who charted the currents and winds of the Atlantic, Pacific, and Indian oceans.

mau·so·le·um (mô'so-lē'əm, -zə-) *n., pl.* **-le·ums** or **-le·a** (-lē'ā). 1. A large stately tomb or a building housing such a tomb or several tombs. 2. A gloomy, usu. large room or building. [ME < Lat. *Mausōleum* < Gk. *Mausōleion* < *Mausōlos*, Mausolus, ancient Persian satrap.] — **mau'so·le·an** *adj.*

mauve (môv) *n.* **Color.** A grayish violet to reddish purple. [Fr. < OFr. *mallow* < Lat. *malva*.] — **mauve** *adj.*

ma·ven also **ma·vin** (mā'vən) *n.* A person who has special knowledge or experience; an expert. [Yiddish *meyvn* < Heb. *mābin*.]

mav·er·ick (māv'or-îk, māv'rîk) *n.* 1. An unbranded range animal, esp. a calf separated from its mother. 2. One that rejects the dictates of or resists adherence to a group; a dissenter. — *adj.* Independent in thought and action or exhibiting such independence. [Poss. after Samuel Augustus *Maverick* (1803–70), Amer. cattleman, or perh. after Samuel *Maverick* (1602?–76?), English-born colonist.]

ma·vis (mā'vîs) *n.* See *song thrush*. [ME < OFr. *mauvîs*, prob. < *mauve*, seagull, mew.]

ma·vour·neen also **ma·vour·nin** (mā-vôdr'nēn') *n.* *Irish.* My darling. [Ir. Gael. *mó mhúirín*: *mó*, my (< OIr. *me-1**) + *múirín*, darling, dim. of *múir*, delight (< OIr. *tumult*, revels).]

maw (mô) *n.* 1. The mouth, stomach, jaws, or gullet of a voracious animal, esp. a carnivore. 2. The opening into something felt to be insatiable. [ME *mawe* < OE *maga*.]

maw·k·ish (mô'kîsh) *adj.* 1. Excessively and objectionably sentimental. 2. Sickening or insipid in taste. [< ME *mawke*, maggot, var. of *magot*. See *MAGGOT*.] — **mawk'ish·ly** *adv.* — **mawk'ish·ness** *n.*

max (māks) *Slang.* *n.* The maximum. — **max** *adj., adv., & v.* **max.** *abbr.* Maximum.

max·i (māk'sē) *n., pl.* **max·is.** A long skirt, coat, or dress that usu. extends to or just past the ankles. [< MAXIMUM.]

max·il·la (māk-sîl'ā) *n., pl.* **max·il·læ** (māk-sîl'ē) or **max·il·las.** 1. *Anat.* Either of a pair of bones of the human skull fusing in the midline and forming the upper jaw. 2. A homologous bone of the skull in other vertebrates. 3. Either of two laterally moving appendages situated behind the mandibles in insects and most other arthropods. [Lat., jawbone.]

max·il·lar·y (māk'sîl'ēr'ē) *adj.* Of or relating to a jaw or jawbone, esp. the upper one. — *n., pl.* **-læ.** A maxillary bone.

max·il·li·ped (māk-sîl'ē-pēd') *n.* One of the three pairs of crustacean head appendages located just posterior to the maxillae and used in feeding. [MAXILL(A) + -PED.]

max·il·lo·fa·cial (māk-sîl'ō-fā'shəl) *adj.* *Anat.* Relating to or involving the maxilla and the face.

max·im (māk'sîm) *n.* A succinct formulation of a fundamental principle, general truth, or rule of conduct. [ME *maxime* < OFr. < Med.Lat. *maxima* < *maxima* (*propositio*), greatest (premise), fem. of Lat. *maximus*, greatest. See *meg-**.]

Max·im (māk'sîm), Sir Hiram Stevens. 1840–1916. Amer.-born British inventor of an automatic recoil-operated machine gun (1884). His brother Hudson (1853–1927) invented smokeless gun powder, and his son Hiram Percy (1896–1936) developed a silencer for firearms.

max·i·mal (māk'sî-məl) *adj.* 1. Of, relating to, or consisting of a maximum. 2. Being the greatest or highest possible. — *n.* *Math.* An element in an ordered set that is followed by no other. — **max'i·mal·ly** *adv.*

max·i·mal·ist (māk'sî-mā-lîst) *n.* One who advocates direct or radical action to secure a social or political goal in its entirety. [Russ. *maksimalist*, name of a splinter group of the Russian Socialist Revolutionary Party, ult. < Lat. *maximum*, maximum. See *MAXIMUM*.] — **max'i·mal·ist** *adj.*

Max·imil·lan (māk'sîm'l'yan). 1832–67. Austrian archduke and emperor of Mexico (1864–67) who was appointed emperor by the French and executed by Mexican republicans.

Maximilian I. 1459–1519. King of Germany (1486–1519) and Holy Roman emperor (1493–1519) who added greatly to the territory and power of the Hapsburgs.

Maximilian II. 1527–76. Holy Roman emperor (1564–76) who was tolerant of Lutheranism.

max·i·mize (māk'sî-mîz') *tr.v.* **-mîzed**, **-mîz·ing**, **-mîz·es**. 1. To increase or make as great as possible. 2. To assign the highest possible importance to. 3. *Math.* To find the largest value of (a function). — **max'i·mî·za'tion** (-mî-zā'shən) *n.* — **max'i·mîz'er** *n.*

max·i·mum (māk'sî-məm) *n., pl.* **-mums** or **-ma** (-mā). 1. a. The greatest possible quantity or degree. b. The greatest quantity or degree reached or recorded; the upper limit of variation. c. The time or period during which the highest point or degree is attained. 2. An upper limit permitted by law or other authority. 3. *Astron.* a. The moment when a variable star is most brilliant. b. The magnitude of the star at such a moment. 4. *Math.* a. The greatest value assumed by a function over a given interval. b. The largest number in a set. — *adj.* 1. Having or being the maximum reached or attainable. 2. Of, relating to, or making up a maximum. [Lat. < neut. of *maximus*, greatest. See *meg-**.]

max·well (māks'wēl', -wəl) *n.* The unit of magnetic flux in the centimeter-gram-second system, equal to 10⁻⁸ weber. [After James Clerk MAXWELL.]

Max·well (māks'wēl', -wəl), James Clerk. 1831–79. British physicist who made fundamental contributions to electromagnetism theory and the kinetic theory of gases.

may (mā) *aux.v.* P.t. **might** (mîht). 1. To be allowed or permitted to: *May I go?* 2. Used to indicate a certain measure of likelihood or possibility: *It may rain.* 3. Used to express a desire or fervent wish: *Long may he live!* 4. Used to express contingency, purpose, or result in clauses introduced by *that* or *so that*: *so that you may understand.* 5. To be obliged; must. Used in deeds and other legal documents. See *Usage Note* at *can*¹. [ME, to be able < OE *mæg*, first and third pers. sing. of *magan*, to be strong, be able. See *magh-**.]

may (mā) *n.* *Chiefly British.* The blossoms of the hawthorn. [Fr. *mai*, hawthorn < *Mai*, May (when it blooms). See *May*.]

May (mā) *n.* 1. The fifth month of the year in the Gregorian calendar. 2. The springtime of life; youth. 3. The celebration of May Day. [ME < OFr. *Mai* < Lat. *Maius* (*mēnsis*), (the month) of Maia < *Maia*, an Italic goddess. See *meg-**.]

May, Cape. A peninsula of S NJ between the Atlantic and Delaware Bay. The S tip forms Cape May Point.

ma·ya (mā'yā) *n.* *Hinduism.* 1. The power of a god or demon to transform a concept into an element of the sensible world. 2. The transitory manifold appearance of the sensible world, which obscures the undifferentiated spiritual reality from which it originates. [Skt. *māyā*.]

Ma·ya (mā'yā) *n., pl.* **Maya** or **-yas.** 1. a. A member of a Mesoamerican Indian people inhabiting southeast Mexico, Guatemala, and Belize, whose civilization reached its height around A.D. 300–900. b. A modern-day descendant of this people. 2. Any of the Mayan languages, esp. Quiché and Yucatec. [Sp.] — **Ma'ya** *adj.*



mausoleum
The Taj Mahal, Agra, India



Maximilian

ā pat	oi boy
ā pay	ou out
ār care	ōō toōk
ā father	ōō bōōt
ē pet	ū cut
ē be	ūr urge
ī pit	th thin
ī ple	th this
īr pier	hw which
ō pot	zh vision
ō toe	ā about
ō paw	item

Stress marks:
/ (primary);
' (secondary), as in
dictionary (dîk'shō-nēr'ē)

LEXSEE 724 F.2D 951

RAYTHEON COMPANY, Appellee/Cross-Appellant, v. ROPER CORPORATION,
Appellant/Cross-Appellee

Appeal Nos. 83-851, 83-853

UNITED STATES COURT OF APPEALS FOR THE FEDERAL CIRCUIT

724 F.2d 951; 1983 U.S. App. LEXIS 13718; 220 U.S.P.Q. (BNA) 592

December 30, 1983

PRIOR HISTORY: [**1] Appeal from the United States District Court for the District of Massachusetts.

DISPOSITION: Affirmed in part, reversed in part, remanded.

COUNSEL: Frank P. Porcelli, of Boston, Massachusetts, argued for Appellant. With him on the brief were W. R. Hulbert and John M. Skenyon.

Martin J. O'Donnell, of Boston, Massachusetts, argued for Appellee. With him on the brief were Robert A. Cesari and Steven J. Henry.

Joseph D. Pannone and William R. Clark, of Lexington, Massachusetts, of Counsel.

JUDGES: Markey, Chief Judge, Davis, Circuit Judge, and Kellam, Senior District Judge.*

* The Honorable Richard B. Kellam, Senior District Judge, Eastern District of Virginia, sitting by designation.

OPINION BY: MARKEY

OPINION

[*953] MARKEY, Chief Judge.

Roper Corporation (Roper) appeals from a judgment of the United States District Court for the District of Massachusetts declaring U.S. Patent No. 4,028,520 ('520 patent), issued to Sumner H. Torrey and assigned to Roper, invalid for lack of utility and because its disclosure is non-enabling. Raytheon Company (Raytheon) cross-appeals a holding of nonobviousness, a finding of infringement, and a refusal to award attorney fees. We reverse in part, [**2] affirm in part, and remand.

BACKGROUND

A. Prior Technology

The Roper patent is directed to a "common cavity" oven capable of conventional thermal cooking, microwave cooking, and pyrolytic self-cleaning (*i.e.*, heating the walls to about 900 degrees F. to break down soil baked thereon). Those three "modes" of operation (thermal cooking, microwave cooking, and self-cleaning) are not totally compatible.

At the time of the Torrey invention, cooking in a thermal oven required minimal amounts of air. Ventilation of thermal oven cavities was accomplished through an opening in the oven door, air flowing by natural convection from the opening upwardly through the cavity and escaping via a vent at the top of the cavity.

Microwave cooking involved radiation supplied by a microwave feed unit. The feed unit included a magnetron generating radiation and an antenna transmitting the radiation to the oven cavity. The radiation travelled from the magnetron to the antenna through a hollow metal tube called a waveguide. The magnetron had projecting fins to help dissipate heat. A fan or blower moved cooling air through the magnetron fins and power supply.

Microwave cooking produced [**3] more moisture than thermal cooking. To remove moisture vapors from the cavity of a conventional microwave oven, a blower or fan was employed to blow them out a vent at the cavity top. Microwave cooking also required maximum sealing of the cavity to prevent escape of microwave energy. Thus, the opening in the oven door of a thermal oven was not desirable in a microwave oven.

Inclusion of a self-cleaning mode further complicated the ventilation of an oven operable in the thermal and microwave modes. Though a limited air supply was needed to flush smoke and volatile products of self-cleaning, excess air caused combustion of those prod-

ucts. That combustion, known as "autoignition", produced sudden pressure that sought release through any opening, including "backflow" through the waveguide. Although autoignition occurred only occasionally, backflow was thought to contaminate ("foul") the waveguide with burnt food particles cleaned from the cavity walls. Moreover, if autoignition were fueled by even greater amounts of excess air, as when forced air removed moisture produced in the microwave mode, fire or explosion could result.

Self-cleaning common cavity ovens were first marketed [**4] in the mid-1960's, but by 1973, the General Electric and Litton ovens on the market still had ventilation problems. To meet those problems, the ends of the waveguides in those ovens were sealed to prevent fouling of the microwave feed unit by autoignition and backflow. As a result, moisture and steam developed in the microwave mode could not be removed by forcing air to the cavity through the waveguide. General Electric and Litton regarded this problem as serious enough to require customer warnings in their product manuals.

B. *The Torrey Invention*

In 1973, Roper began work on a self-cleaning common cavity oven. Under Torrey's [*954] supervision, Roper developed an oven with proper ventilation during the microwave, thermal, and self-cleaning modes, and which, to Torrey's surprise, had no fouling problems.

In the summer of 1976, Roper marketed its oven nationally under its own name and through Sears, Roebuck & Company under the Kenmore label. About 24,000 have been sold, with no complaints respecting contamination of the microwave feed system. The Roper oven was and is a successful product.

Torrey's February 26, 1976 application for patent issued without amendment [**5] as the '520 patent on June 7, 1977. The patented invention is depicted by this simplified drawing, shown alongside a simplified drawing of the accused Raytheon oven:

[SEE ILLUSTRATION IN ORIGINAL]

In the Torrey invention, the microwave entry is located at the bottom of the oven cavity. Air to remove microwave cooking moisture is forced into the cavity through the microwave system. A pattern of small passages is provided in the wall of the waveguide so that a portion of the air from the blower, which cools the magnetron, flows through the waveguide and hollow conductor. When the blower is on, the air path is from the waveguide, through the cavity and venting through the top. When the blower is off, during thermal cooking and self-cleaning, convected air ventilates the cavity via the same path. The small passages are sufficiently screened to avoid leakage of radiation. The patent specification

discloses a forced air flow of three to eight cubic feet per minute (cfm), and a convection flow of 0.5 to 2.0 cfm.

There are five independent and two dependent claims in the '520 patent. Claim 5, on which claims 6 and 7 depend, is representative:

5. In a combined microwave-thermal [**6] range, the combination comprising a frame having walls defining a rectangular oven cavity and a lower space of conforming shape, a door enclosing and sealing the front surface of the cavity against passage of air and microwave energy, a thermal element in the cavity, control means for operation of the thermal element within a normal temperature range for food preparation and at a high temperature level for a self-cleaning mode, the walls of the cavity being insulated, [*955] the bottom wall of the cavity having an inlet opening, means defining a cavity air vent at the top of the cavity, a microwave power supply having a housing including a magnetron and blower, the blower having a blower inlet and arranged to draw in cooling air for discharged under slight pressure to the magnetron, a waveguide having an inlet connected to the magnetron and extending under the bottom wall of the cavity to terminate at an outlet, means for connecting the outlet of the waveguide to the inlet opening of the cavity for conduction of microwave energy into the cavity, the waveguide being open to passage of cooling air from the magnetron so at least a portion of the pressurized air from the blower and [**7] magnetron passes through the waveguide and into the cavity for ventilating the cavity when the magnetron and blower are turned on, the blower inlet being located at a level below the bottom wall of the cavity so that when the blower and magnetron are turned off and the thermal element is turned on air is thermally convected through the blower inlet, magnetron, and waveguide into the cavity for final exit through the cavity air vent at the top thereof, the air passage through the blower, magnetron and waveguide being sufficiently constricted so that the air is convected in the self-cleaning mode at a level below that which is capable of producing an explosive reaction with the products of thermal decomposition.

All claims are reproduced in the Appendix.

C. *District Court Proceedings*

On September 9, 1980, Raytheon sued for a declaratory judgment that the '520 patent was invalid. Roper counterclaimed for infringement of all claims. After trial without a jury, the district court issued an opinion on January 20, 1983, and a judgment on January 28, 1983.

The district court declared the patent invalid because of a lack of utility required by 35 U.S.C. § 101¹ and [**8] the absence of enabling disclosure required by 35 U.S.C. § 112.² The district court also found that the Torrey invention was a commercial success, held that the invention would have been nonobvious,³ and found that if the claims were valid, Raytheon would be liable for having infringed them.⁴

1 35 U.S.C. § 101 states:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

2 35 U.S.C. § 112, paragraph one, states:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same, and shall set forth the best mode contemplated by the inventor of carrying out his invention.

3 35 U.S.C. § 103 states:

A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains.

[**9]

4 35 U.S.C. § 271(a) states:

Except as otherwise provided in this title, whoever without authority makes, uses or sells any patented invention, within the United States during the term of the patent therefor, infringes the patent.

Because the case was not in its view an "exceptional" one, as required by 35 U.S.C. § 285,⁵ the district court refused to award attorney fees to Raytheon.

5 35 U.S.C. § 285 states:

The court in exceptional cases may award reasonable attorney fees to the prevailing party.

ISSUES

Did the district court err in (1) its judgment of invalidity under 35 U.S.C. §§ 101 and 112; (2) its holding of nonobviousness under 35 U.S.C. § 103; (3) its finding of infringement; (4) its failure to award attorney fees.

[*956] OPINION

A. *Standard of Review*

Raytheon argues the evidence *de novo*. As Roper correctly points out, this court does not review the fact record [**10] *de novo*. District court findings must be accepted unless they are predicated on an improper legal foundation, *see, e.g., W.L. Gore & Associates, Inc. v. Garlock, Inc.*, 721 F.2d 1540, slip op. at 8-9 (Fed. Cir. 1983), or unless they are shown by the party challenging them to be "clearly erroneous", *i.e.*, unless this court is left with the "definite and firm conviction that a mistake

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has been committed". *Inwood Laboratories, Inc. v. Ives Laboratories, Inc.*, 456 U.S. 844, 855, 72 L. Ed. 2d 606, 102 S. Ct. 2182, 2189 (1982). The clearly erroneous standard applies to findings, not to legal conclusions.

B. Invalidity for Lack of Utility

Utility is a fact question, *see e.g., Wilden Pump v. Pressed & Welded Products Co.*, 655 F.2d 984, 988, 213 USPQ 282, 285 (9th Cir. 1981); *Nickola v. Peterson*, 580 F.2d 898, 911, 198 USPQ 385, 399 (6th Cir. 1978), *cert. denied*, 440 U.S. 961, 59 L. Ed. 2d 774, 99 S. Ct. 1504 (1979). In determining utility, however, the claims must first be interpreted to define the invention to be tested for utility. Claim interpretation is a legal matter subject to review free of the clearly erroneous standard applicable to fact findings. [**11] *Fromson v. Advance Offset Plate, Inc.*, 720 F.2d 1565, slip op. at 8-9 (Fed. Cir. 1983).

In this case, the district court's holding that claim 1 is invalid must be affirmed, but its holding of invalidity for lack of utility in the inventions set forth in claims 2-7 must be reversed because the latter rests on an erroneous interpretation of those claims, as well as on other incorrect legal bases.

1. *The district court correctly interpreted and held invalid claim 1 but erroneously interpreted claims 3 and 4 as requiring prevention of backflow during autoignition.*

In *Linde Air Products Co. v. Graver Tank & Mfg. Co.*, 86 F. Supp. 191, 197, 75 USPQ 231, 235 (N.D. Ind. 1947), *rev'd*, 167 F.2d 531, 536-37, 77 USPQ 207, 212 (7th Cir. 1948), *aff'd*, *Graver Mfg. Co. v. Linde Co.*, 336 U.S. 271, 277-79, 93 L. Ed. 672, 69 S. Ct. 535 (1949), certain process claims were held invalid because they included incorrect ideas and:

To make a claim for a . . . process in which these erroneous ideas are incorporated is to stake out a process . . . which does not in point of fact exist within the invention. While a patent covering a meritorious invention should not be struck [**12] down because the patentee has misconceived the scientific principle of his invention, the error cannot be overlooked when the misconception is embodied in the claim.

Accord, Noma Lites Canada Ltd. v. Westinghouse Electric Corp., 399 F. Supp. 243, 253, 186 USPQ 485, 493 (D.D.C. 1975) ("When an incorrect or questionable

theory of operation is included in a patent claim, that claim is invalid. 35 U.S.C. § 112."). Because it is for the invention as claimed that enablement must exist, and because the impossible cannot be enabled, a claim containing a limitation impossible to meet may be held invalid under § 112. Moreover, when a claim requires a means for accomplishing an unattainable result, the claimed invention must be considered inoperative as claimed and the claim must be held invalid under either § 101 or § 112 of 35 U.S.C. *See e.g., General Electric Co. v. United States*, 215 Ct. Cl. 636, 572 F.2d 745, 755, 198 USPQ 65, 93 (1978); *In re Harwood*, 55 C.C.P.A. 922, 390 F.2d 985, 989, 156 USPQ 673, 676 (1968); *CPC International, Inc. v. Standard Brands, Inc.*, 385 F. Supp. 1057, 1061, 184 USPQ 332, 335 (D. Del. 1974); *Novelart Mfg. Co. v. Carlin Container Corp.*, 363 F. Supp. 58, 76, 179 USPQ 17, 29 (D.N.J. 1973). Whether the appropriate basis for holding claim 1 invalid be failure of compliance with the utility requirement of § 101 or with the enablement requirement of § 112, therefore, that holding must be affirmed.

In the present case, the district court interpreted claims 1, 3 and 4 as requiring [**957] that the inventions set forth in those claims include a means for continuing convection during autoignition. The district court found, however, that convection did not in fact occur during occasional autoignition in the Roper oven, a finding which is not clearly erroneous. Given that claim interpretation and finding, the district court was compelled under the above authorities to hold those claims invalid. However, though the district court was correct in interpreting and holding invalid claim 1, it legally erred in interpreting claims 3 and 4.

Claim 1 specifically provides: "the blower inlet being located at a level below the bottom wall of the cavity so that when the blower and magnetron are turned off and the thermal element is turned on air is thermally convected from the blower inlet through the air passages into [**14] the waveguide and into the cavity for exiting through the cavity air vent notwithstanding the autoignition pressure which exists in the cavity under high temperature self-cleaning conditions" (emphasis added). Though, as discussed *infra*, the phrase is based on Torrey's erroneous theory respecting the absence of waveguide fouling, and though the functional language is introduced by "so that", we must read the phrase as the equivalent of one specifying as an element in the claim "means for continuing convection during autoignition". Because the required continuation of convection (described by the parties as "prevention of backflow") during periods of autoignition does not and physically cannot happen, claim 1 must be held invalid. *Graver Mfg. Co., supra*.

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The district court impermissibly read the above-quoted language from claim 1 into claims 3 and 4. The impropriety of reading limitations into claims is dramatized where, as here, the limitation sought to be added is already present in another claim. *Environmental Designs, Ltd. v. Union Oil Co. of California*, 713 F.2d 693, 699, 218 USPQ 865, 870-71 (Fed. Cir. 1983). *Accord, Fromson v. Advance Offset Plate, Inc.*, [**15] *supra*, slip op. at 11; *Caterpillar Tractor Co. v. Berco, S.P.A.*, 714 F.2d 1110, 1116, 219 USPQ 185, 188 (Fed. Cir. 1983); *Kalman v. Kimberly Clark Corp.*, 713 F.2d 760, 770, 218 USPQ 781, 788 (Fed. Cir. 1983).

In arguing that claims must be read in light of the specification, that prevention of backflow is the "essence" of Torrey's invention, and that *all* claims must therefore be read as including the quoted limitation of claim 1, Raytheon confuses the respective roles of the specification and claims. That claims are interpreted in light of the specification does not mean that everything expressed in the specification must be read into all the claims. On the contrary, as was said in *Environmental Designs, supra*, 713 F.2d at 699, 218 USPQ at 871:

the specification must be sufficiently explicit and complete to enable one skilled in the art to practice the invention, while a claim defines only that which the patentee regards as his invention. 35 U.S.C. § 112. The claim, not the specification, measures the invention. (Case cited). The argument that claim 1 must include a limitation found in the specification is thus legally unsound. *Smith v. Snow*, [**16] 294 U.S. 1, 79 L. Ed. 721, 55 S. Ct. 279 (1935).

Raytheon says Roper is precluded by an "appeal estoppel" from contesting the inclusion of "no backflow during autoignition" in all claims because Roper relied on "no backflow" in the district court and should not be allowed to change its theory on appeal. Examination of the trial record, however, reveals that Roper there stressed the theory it urges on appeal, and that it was *Raytheon* which argued that the "essence" of Roper's invention was no backflow during autoignition.

In its opening statement at trial, Roper stressed "no fouling" and various other objectives without once mentioning "no backflow" (let alone "no backflow during autoignition"). In Roper's forty-page Proposed Findings of Fact and Conclusions of Law, Roper mentioned *only once* (proposed finding 79) that there is no backflow during autoignition. In its pretrial brief, Roper stated that it:

[**958] discovered that by positioning the microwave feed system below the oven cavity, and providing an air path from an air inlet below the cavity through the microwave feed system (including the waveguide) and up into the cavity, natural convection [**17] would draw air through that path to the oven cavity and up through it to result in sufficient venting of the oven during both thermal cooking and self-cleaning. *For reasons not really understood*, the waveguide through which convected air flowed would not be fouled by normal autoignition pressures that occur during self-cleaning, even though the waveguide entry location at the bottom of the oven cavity would seem to be a place subject to particularly high contamination. [Emphasis added]

That is not the approach of one hinging its entire case and all the claims on "no backflow during autoignition". The unchallenged evidence established that Roper's ovens experienced no fouling or contamination. There is no basis in the record, therefore, for the imposition of an "appeal estoppel" precluding Roper from reliance on the claims as written and allowed.

2. The district court erroneously interpreted claims 1, 2 and 5-7 as requiring the prevention of autoignition.

The district court, at Raytheon's urging, interpreted claims 1, 2 and 5-7 as requiring the prevention of autoignition. Because autoignition clearly occurs, that interpretation apparently led to the holding [**18] that those claims were invalid for lack of utility. That interpretation, however, was legally erroneous, and Raytheon has virtually abandoned it in its briefs on appeal.

The district court apparently and incorrectly equated prevention of "autoignition" with prevention of "explosive reactions", the latter being required by claims 1, 2 and 5-7. As the district court found, autoignition occurs when the decomposition products of pyrolytic self-cleaning react with some excess air to produce combustion. It is only when greater amounts of air enter the cavity that autoignition might escalate into an "explosion". Torrey did not claim to prevent autoignition; he claimed only to prevent explosions by restricting the air path to limit the excess of air to a level below that productive of explosions. As stated by Roper in its Proposed Findings of Fact and Conclusions of Law, "it is well known in the art that one cannot completely eliminate the possibility of autoignition", and "too much air in the oven during self-cleaning causes the autoignition to

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become severe and even explosive". The patent itself addresses autoignition as something to be "resisted", not eliminated. Moreover, the [**19] difference in the two concepts is illustrated by claim 1's express acceptance of "autoignition pressure" and prevention of an "explosive reaction".

Thus, although claim 1 was correctly held invalid as set forth in section 1 above, there is no basis in the record on which to hold claims 2-7 invalid for lack of utility.

3. *A claimed invention need not accomplish all objectives stated in the specification.*

The district court held the '520 patent invalid in part because Roper's oven, as set forth in claims interpreted by the district court as requiring prevention of backflow and autoignition, failed to accomplish all objectives stated in the patent. Raytheon urged at oral argument that that holding is compelled by *Mitchell v. Tilghman*, 86 U.S. (19 Wall.) 287, 396-97, 22 L. Ed. 125 (1873) (a patent is void "if the described result cannot be obtained by the described means"). In *Mitchell*, the described result was production of fatty acids and glycerin from fatty or oily substances by the action of water at high temperature and pressure. *Id.* at 296, 380. That was the single result stated and was an element of the claim. *Id.* at 296. To interpret *Mitchell* [**20] as requiring that all claims must set forth inventions satisfying all objectives would make no sense. When a properly claimed invention meets at least one stated objective, utility under § 101 is clearly shown. See e.g., *Standard Oil Co. (Indiana) v. Montedison, S.P.A.*, 664 F.2d 356, 375, 212 USPQ 327, [*959] 344 (3rd Cir. 1981), *cert. denied*, 456 U.S. 915, 102 S. Ct. 1769, 72 L. Ed. 2d 174 (1982); *E.I. du Pont de Nemours & Co. v. Berkley & Co.*, 620 F.2d 1247, 1258 n.10, 1260 n.17, 205 USPQ 1, 8 n.10, 10 n.17 (8th Cir. 1980); *Krantz and Croix v. Olin*, 53 C.C.P.A. 1582, 148 USPQ 659, 661-62, 356 F.2d 1016 (CCPA 1966); Chisum on Patents, para. 4.04[4] [1983].

Here, the Torrey invention as set forth in claims 2-7 clearly accomplished at least one, and a major one, of the patent's stated objectives, i.e., a "ventilating system for a common cavity oven usable in all three modes of operation and which is safe in all three modes and which runs no risk of violent explosion of the products of combustion in the self-clean mode". The incorrectness of Torrey's theory explaining the absence of fouling (i.e., that continued convection prevented backflow during [**21] autoignition) does not undermine the unchallenged accomplishment of the quoted objective by the ovens set forth in claims 2-7. Torrey was attempting to explain in his specification why his tests showed no fouling, and a patentee is not responsible for the correctness of such theories and explanations when their correctness is not related to validity of the claims under consideration. See

e.g., *Fromson v. Advance Plate, Inc.*, *supra*, slip op. at 11. (In *Fromson*, the sole issue was infringement, and validity of non-asserted claims including a limitation based on the patentee's theory that an alumino-silicate layer was produced, was not before the court.)

4. *Lack of utility cannot co-exist with infringement and commercial success.*

The wisdom of the trial court in deciding validity and infringement, and the interrelationship of those issues, are manifested in the present case. See *Medtronic, Inc. v. Cardiac Pacemakers*, 721 F.2d 1563, slip op. at 43 (Fed. Cir. 1983); *Gore v. Garlock*, *supra*, slip op. at 40.

The district court's finding on infringement of claim 1 was clearly erroneous because Raytheon's proof established the impossibility of its oven having [**22] a means to continue convection during autoignition. However, the court's finding on infringement of claims 2-7 was not clearly erroneous. See section E, *infra*. That finding compels the conclusion that claims 2-7 cannot be held invalid for lack of utility.

A correct finding of infringement of otherwise valid claims mandates as a matter of law a finding of utility under § 101. See e.g., *E.I. du Pont de Nemours & Co. v. Berkley & Co.*, *supra*, 620 F.2d at 1258-61, 205 USPQ at 8-11; *Tapco Products Co. v. Van Mark Products Corp.*, 446 F.2d 420, 428, 170 USPQ 550, 555-56 (6th Cir.), *cert. denied*, 404 U.S. 986, 30 L. Ed. 2d 370, 92 S. Ct. 451 (1971). The rule is not related, as Raytheon argues, to whether a defendant may simultaneously assert non-utility and non-infringement; a defendant may do so. The rule relates to the time of decision not to the time of trial, and is but a common sense approach to the law. If a party has made, sold, or used a properly claimed device, and has thus infringed, proof of that device's utility is thereby established. People rarely, if ever, appropriate useless inventions.

Proof of such utility is further supported when, as here, [**23] the inventions set forth in claims 2-7 have on their merits been met with commercial success. See e.g., *Medtronic, Inc.*, *supra*, slip op. at 43; *Wilden Pump v. Pressed & Welded Products Co.*, *supra*, 655 F.2d at 988, 213 USPQ at 285; *CTS Corp. v. Piher International Corp.*, 527 F.2d 95, 105, 188 USPQ 419, 428 (7th Cir. 1975), *cert. denied*, 424 U.S. 978, 96 S. Ct. 1485, 47 L. Ed. 2d 748 (1976).

In sum, we hold in this section B that claims 2-7 are not invalid for lack of utility.

C. *Invalidity Under 35 U.S.C. § 112*

After stating that Raytheon's challenge under § 112 was largely a restatement of its challenge under § 101,

724 F.2d 951, *; 1983 U.S. App. LEXIS 13718, **;
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the district court held that Raytheon had sustained its burden of proving invalidity under the former. We agree that the two defenses rest on the same foundation in this case. Having reversed the holding of invalidity of claims 2-7 under § 101, we accordingly reverse the holding with respect to [*960] those claims under § 112. We conclude as a matter of law that the specification of the '520 patent contains a clear description enabling one skilled in the art to make and use the inventions set forth in claims 2-7.⁶

6 Enablement under 35 U.S.C. § 112, paragraph 1, is a question of law. *In re Hogan*, 559 F.2d 595, 604, 194 USPQ 527, 535 (CCPA 1977); *In re Brandstadter*, 484 F.2d 1395, 1405, 179 USPQ 286, 293 (CCPA 1973); *In re Naquin*, 55 C.C.P.A. 1428, 398 F.2d 863, 866, 158 USPQ 317, 319 (1968); *In re Chilowsky*, 50 C.C.P.A. 806, 306 F.2d 908, 909, 134 USPQ 515, 516 (1962). *Accord*, *Plastic Container Corp. v. Continental Plastics of Oklahoma, Inc.*, 607 F.2d 885, 891-92 n.9, 203 USPQ 27, 32 n.9 (10th Cir. 1979), *cert. denied*, 444 U.S. 1018, 62 L. Ed. 2d 648, 100 S. Ct. 672 (1980); *Hirschfeld v. Banner*, 462 F. Supp. 135, 142, 200 USPQ 276, 281 (D.D.C. 1978), *aff'd*, 199 U.S. App. D.C. 9, 615 F.2d 1368 (D.C. Cir. 1980), *cert. denied*, 450 U.S. 994, 101 S. Ct. 1695, 68 L. Ed. 2d 193 (1981).

[**24] D. 35 U.S.C. § 103

The district court properly approached and decided the nonobviousness/obviousness issue in light of 35 U.S.C. § 103. First, it recognized the statutory presumption of validity and that the burden was on Raytheon to overcome it by proving facts with clear and convincing evidence. *See e.g.*, *Connell v. Sears, Roebuck & Co.*, 722 F.2d 1542, slip op. at 13 (Fed. Cir. 1983).⁷ Second, the court neither ignored nor modified the presumption merely because Raytheon cited prior art not before the Patent Office. Citation of such art -- even when more pertinent than the art before the Examiner (which the district court correctly found was not the case here) -- does not destroy the presumption, although it may make it easier for the one attacking validity to overcome the burden set by 35 U.S.C. § 282. *See Connell, supra*, slip op. at 13. Third, the district court correctly assessed the evidence in light of the factual inquiries enunciated in *Graham v. John Deere Co.*, 383 U.S. 1, 15 L. Ed. 2d 545, 86 S. Ct. 684 (1966).

7 That presumption, stated in 35 U.S.C. § 282, also applies to utility. *See e.g.*, *Medtronics, Inc. v. Cardiac Pacemakers, Inc.*, *supra*, slip op. at 6.

[**25] Presumably, the district court's conclusion of nonobviousness (and finding of infringement, discussed *infra*) applied to all claims, although the opinion did not so state (the "patent" was declared invalid; the "claims" were found infringed). For purposes of this appeal, "the claimed invention" in what follows concerning nonobviousness and infringement may be read as in light of representative claim 5. Because the claims were not argued separately on appeal, and because differences in the claims cannot here affect the result, all claims (except claim 1) can be seen to stand or fall with claim 5. *See e.g.* *In re Kaslow*, 707 F.2d 1366, 1376, 217 USPQ 1089, 1096 (Fed. Cir. 1983).

1. *The Prior Art*

The relevant prior art encompassed microwave ovens, combination microwave-thermal ovens, and self-cleaning thermal ovens. A summary of relevant prior art teachings is contained in the "Background" section, *supra*. Additionally, although the prior art taught placement of a microwave feed unit below a microwave oven, it taught away from placing an open feed unit below a self-cleaning common cavity oven because the art believed the unit would be contaminated.

2. *Differences* [**26] *Between the Prior Art and the Claimed Invention*

The claimed invention is a self-cleaning common cavity oven having, *inter alia*, (1) an open waveguide located at the bottom, (2) through which forced, cooling air from the blower passes during the microwave mode only, and (3) ventilation occurs via convection through the waveguide openings during the thermal and self-cleaning modes. No self-cleaning common cavity oven existing at the time of the Torrey invention embodied any of those three elements.

3. *Level of Ordinary Skill in the Art*

Raytheon and Roper employed people skilled in the art of designing ovens for cooking food in both microwave and thermal modes, among them graduate engineers with substantial background and experience [*961] in the design, development, and marketing of ovens.

4. *Objective Evidence of Nonobviousness*

Evidence of long felt need, unexpected results and commercial success is outlined in the "Background" section, *supra*.

5. *Conclusion on Nonobviousness*

The district court concluded that Raytheon did not overcome the presumption of nonobviousness, and we agree. Raytheon has not shown these findings to have been clearly [**27] erroneous: the findings under 1-3

above; the finding that persons of ordinary skill were unable to devise a common cavity oven with proper ventilation and a pyrolytic self-cleaning feature; or the finding that Torrey unexpectedly found that his invention worked. Those fact findings, together with those on commercial success and the prior art's teaching away from location of the open waveguide at the bottom of a self-cleaning common cavity oven, are highly probative, objective criteria fully capable of serving as a foundation for the legal conclusion of nonobviousness.

Raytheon suggests that Roper merely combined well known elements to form its oven. In the district court, Raytheon was more explicit, citing a single sentence from the opinion in *Great Atlantic & Pacific Tea Co. v. Supermarket Equipment Corp.*, 340 U.S. 147, 95 L. Ed. 162, 71 S. Ct. 127 (1950) ("courts should scrutinize combination patent claims with a care proportioned to the difficulty and improbability of finding invention in an assembly of old elements"). This court has been unable to construe the cited sentence, however, "as a rule of law applicable broadly to patent cases because virtually every claimed [**28] invention is a combination of old elements", *Medtronic, Inc. v. Cardiac Pacemakers, Inc.*, *supra*, 721 F.2d at 1566, and because the Supreme Court has held combinations of old elements patentable. *See, e.g., United States v. Adams*, 383 U.S. 39, 51-52, 15 L. Ed. 2d 572, 86 S. Ct. 708 (1966). It is moreover simplistically unrealistic to employ a separate test of patentability for combinations of old elements when the language of the 1952 Patent Act provides no basis for either classifying patents into different "types" or for applying different treatment to different "types" of patents. *Accord, Richdel, Inc. v. Sunspool Corp.*, 714 F.2d 1573, 1579-80, 219 USPQ 8, 12 (Fed. Cir. 1983); *Environmental Designs, Ltd. v. Union Oil Co. of Cal.*, *supra*, 713 F.2d at 698, 218 USPQ at 870.

E. Infringement

Whether an accused device infringes properly interpreted claims is a fact question. *See e.g., Fromson v. Advance Offset Plate, Inc.*, *supra*, slip op. at 8-9. Here, the district court apparently found infringement under the doctrine of equivalents. The test for equivalency is whether the accused device "performs substantially the same function in substantially the same [**29] way to obtain the same result" as the claimed invention. *Hughes Aircraft v. United States*, 717 F.2d 1351, 1361, 219 USPQ 473, 480 (Fed. Cir. 1983). The finding on equivalency is subject to the clearly erroneous standard on review. *Thomas & Betts Corp. v. Litton Systems, Inc.*, 720 F.2d 1572, slip op. at 12-13 (Fed. Cir. 1983). Here, the district court's ultimate finding of equivalence (except in respect of claim 1) has not been shown to have been clearly erroneous.

Raytheon asserts three differences between its oven and the claimed invention. First, the former has a gap in its door, and the claim includes "a door enclosing and sealing the front surface of the cavity against passage of air and microwave energy". Raytheon's gap precludes a finding of literal infringement but not a finding of infringement under the doctrine of equivalents. The district court found that Raytheon's gap does not materially affect entry of air, most of which comes through the waveguide, only the most minor amounts being admitted through the gap. The district court said, "the functioning of the air flow system taught in the Torrey claims is embraced by the Raytheon oven". That finding has [**30] not been shown to have been clearly erroneous.

[*962] Second, Raytheon says its oven does not prevent backflow and autoignition, and all claims should be interpreted as requiring prevention of both. As above indicated, however, only claim 1 contains a "no back-flow" limitation, and no claim contains a "no autoignition" limitation. Hence, only the court's finding that claim 1 is infringed is clearly erroneous.

Third, Raytheon argues that convection air does not enter its waveguide through its blower inlet, as required by claims 2 and 4-7, nor through the blower inlet and housing vent as called for in claim 3, but through a hole in the duct attached to its waveguide. Raytheon's convection air from its attached duct, however, "performs substantially the same function in substantially the same way to obtain the same result" as convection air from the blower inlet, and the district court's finding of equivalence in convection air inlet locations has not been shown to have been clearly erroneous.

Attorney Fees

Under 35 U.S.C. § 285, a district court may award such fees to the prevailing party in "exceptional" cases. The decision to award or deny fees is discretionary [**31] with the district court. *See e.g., Orthopedic Equipment Co. v. All Orthopedic Appliances*, 707 F.2d 1376, 1384, 217 USPQ 1281, 1287 (Fed. Cir. 1983). No basis has been shown for a determination that the district court abused its discretion in denying attorney fees to Raytheon.

CONCLUSION

The district court did not err in holding claim 1 invalid, in holding that the inventions set forth in claims 2-7 would have been nonobvious, in finding claims 2-7 infringed, or in denying Raytheon's request for attorney fees. The district court did err in holding claims 2-7 invalid under 35 U.S.C. § 101 for lack of utility and under 35 U.S.C. § 112 for lack of an enabling disclosure.

Accordingly, we affirm the judgment that claim 1 is invalid, affirm the judgment that claims 2-7 are not inva-

lid under 35 U.S.C. § 103, affirm the judgment that claims 2-7 are infringed by the accused Raytheon ovens, affirm the denial of attorney fees to Raytheon, reverse the district court's judgment that claims 2-7 are invalid, and remand for further proceedings consistent herewith.

AFFIRMED IN PART; REVERSED IN PART;
REMANDED.

APPENDIX -- CLAIMS OF ROPER PATENT

1. In a combined microwave-thermal [**32] range, the combination comprising a frame having walls defining a rectangular oven cavity and a lower space, a door enclosing and sealing the front surface of the cavity against passage of air and microwave energy, a thermal element in the cavity, control means for operation of the thermal element at a normal temperature level for food preparation and at a high level for a self-cleaning mode, the walls of the cavity being insulated, the bottom wall of the cavity having an inlet opening, means defining a cavity air vent at the top of the cavity, a microwave power supply including a blower and a magnetron having cooling fins, the blower having a blower inlet for drawing in cooling air and an outlet for supplying such air under slight pressure to the cooling fins, a waveguide having an inlet connected to the magnetron and extending under the bottom wall of the cavity to terminate at an outlet, means for connecting the outlet of the waveguide to the inlet opening of the cavity for conduction of microwave energy into the cavity, means defining air passages of limited cross section for conducting air from the magnetron into the waveguide so that a portion of the pressurized air passes through [**33] the waveguide and into the cavity for ventilating the cavity when the magnetron and blower are turned on, the blower inlet being located at a level below the bottom wall of the cavity so that when the blower and magnetron are turned off and the thermal element is turned on air is thermally convected from the blower inlet through the air passages into the waveguide and into the cavity for exiting [**963] through the cavity air vent notwithstanding the auto ignition pressure which exists in the cavity under high temperature self-cleaning conditions, the convection path of the air being sufficiently constricted so that air is convected in the self-cleaning mode at a level below that which is capable of producing an explosive reaction with the products of decomposition.

2. In a combined microwave-thermal range, the combination comprising a frame having walls defining a rectangular oven cavity and a lower space, a door enclosing and sealing the front surface of the cavity against passage of air and microwave energy, a thermal element in the cavity, control means for operation of the thermal element within a normal temperature range for food preparation and at a high temperature level [**34] for a

self-cleaning mode, the walls of the cavity being insulated, the bottom wall of the cavity having an inlet opening, means defining a cavity air vent at the top of the cavity, a microwave power supply having a housing including a magnetron and blower, the blower having a blower inlet and arranged to draw in cooling air for supplying under slight pressure to the magnetron with discharge of at least a portion of the air into the housing to create slight pressure therein, a waveguide having an inlet connected to the magnetron and extending under the bottom wall of the cavity to terminate at an outlet, means for connecting the outlet of the waveguide to the inlet opening of the cavity for conduction of microwave energy into the cavity, means defining a pattern of small air passages from the housing to the waveguide so that at least a portion of the pressurized air from the housing passes through the air passage and waveguide and into the cavity for ventilating the cavity when the magnetron and blower are turned on, all portions of the waveguide and housing including the blower inlet being located at a level below the bottom wall of the cavity so that when the blower and magnetron are turned [**35] off and the thermal element is turned on air is thermally convected from the blower inlet through the small air passages and waveguide into the cavity for exiting through the cavity air vent, the convection path of the air being sufficiently constricted so that air is convected in the self-cleaning mode at a level below that which is capable of producing an explosive reaction with the products of thermal decomposition.

3. In a combined microwave-thermal range, the combination comprising a frame having walls defining a rectangular oven cavity and a lower space, a door enclosing and sealing the front surface of the cavity against passage of air and microwave energy, a thermal element in the cavity, the walls of the cavity being insulated, the bottom wall of the cavity having an inlet opening, means defining a cavity air vent at the top of the cavity, a microwave power supply having a housing including a magnetron and blower, the blower having a blower inlet and arranged to draw in cooling air from outside the housing for supplying under slight pressure to the magnetron, the cooling air being discharged from the magnetron into the housing for creating internal pressure therein, a waveguide [**36] coupled to the magnetron and extending along the housing and under the bottom wall of the cavity, the waveguide having an outlet aligned with the opening in the bottom wall of the cavity, a hollow open-ended conductor extending through the opening for coupling the outlet of the waveguide to the cavity, means for securing the upper end of the hollow conductor to the bottom wall of the cavity and the lower end of the conductor to the waveguide for conduction of microwave energy into the cavity, the wall of the waveguide having a pattern of small openings communi-

cating with the housing so that a portion of the pressurized air from the blower and magnetron passes through the waveguide and hollow conductor into the cavity for ventilating the cavity when the magnetron and blower are turned on, the housing having a relatively large vent opening through which the pressurized air therefrom passes outwardly to reduce the internal pressure in the housing thereby to reduce the flow of air through the pattern of small openings and into the cavity to a predetermined low level, the blower inlet [*964] and large vent opening being located at a level below the bottom wall of the cavity so that [**37] when the blower and magnetron are turned off and the thermal element is turned on flow of air through the large vent opening is reversed in direction flowing inwardly through such vent opening into the housing and through the small openings via the waveguide into the cavity with final exiting through the cavity air vent.

4. In a combined microwave-thermal range, the combination comprising a frame having walls defining a rectangular oven cavity and a lower space, a door enclosing and sealing the front surface of the cavity against passage of air and microwave energy, a thermal element in the cavity, the walls of the cavity being insulated, the bottom wall of the cavity having an inlet opening, means defining a cavity air vent at the top of the cavity, a microwave power supply having a housing including a magnetron and blower, the blower having a blower inlet and arranged to draw in cooling air for supplying under slight pressure to the magnetron, a waveguide coupled to the magnetron and extending under the bottom wall of the cavity, the waveguide having an outlet aligned with the opening in the bottom wall of the cavity, a hollow open-ended conductor extending through the opening [**38] for coupling the outlet of the waveguide to the cavity, means for securing the upper end of the hollow conductor to the bottom wall of the cavity and the lower end of the conductor to the waveguide for conduction of microwave energy into the cavity, an antenna element centered in the hollow conductor and projecting into the cavity for guiding microwave energy to the latter, means for conducting at least a portion of the pressurized air from the blower and magnetron through the waveguide and hollow conductor into the cavity for ventilating the cavity when the magnetron and blower are turned on, the blower inlet being located at a level below the bottom wall of the cavity so that when the blower and magnetron are turned off and the thermal element is turned on air is convected through the blower inlet, waveguide and hollow conductor into the cavity for exiting through the cavity air vent at the top thereof.

5. In a combined microwave-thermal range, the combination comprising a frame having walls defining a rectangular oven cavity and a lower space of conforming shape, a door enclosing and sealing the front surface of the cavity against passage of air and microwave energy, a thermal [**39] element in the cavity, control means for operation of the thermal element within a normal temperature range for food preparation and at a high temperature level for a self-cleaning mode, the walls of the cavity being insulated, the bottom wall of the cavity having an inlet opening, means defining a cavity air vent at the top of the cavity, a microwave power supply having a housing including a magnetron and blower, the blower having a blower inlet and arranged to draw in cooling air for discharge under slight pressure to the magnetron, a waveguide having an inlet connected to the magnetron and extending under the bottom wall of the cavity to terminate at an outlet, means for connecting the outlet of the waveguide to the inlet opening of the cavity for conduction of microwave energy into the cavity, the waveguide being open to passage of cooling air from the magnetron so at least a portion of the pressurized air from the blower and magnetron passes through the waveguide and into the cavity for ventilating the cavity when the magnetron and blower are turned on, the blower inlet being located at a level below the bottom wall of the cavity so that when the blower and magnetron are turned [**40] off and the thermal element is turned on air is thermally convected through the blower inlet, magnetron, and waveguide into the cavity for final exit through the cavity air vent at the top thereof, the air passage through the blower, magnetron and waveguide being sufficiently constricted so that the air is convected in the self-cleaning mode at a level below that which is capable of producing an explosive reaction with the products of thermal decomposition.

[*965] 6. The combination as claimed in claim 5 in which the constriction in the air passage through the blower inlet, magnetron and waveguide is in the form of a pattern of small openings in the wall of the waveguide and in communication with the housing, the openings being of sufficiently small dimension so as to preclude the escape of microwave energy therethrough.

7. The combination as claimed in claim 6 in which the openings in the wall of the waveguide and the vent opening are sufficiently limited in total area as to limit the flow of air for microwave cookery to within the range of three to eight c.f.m. when the blower is on and to reduce the flow of convected air under baking and self-cleaning conditions to within [**41] the range of 0.5 to 2 c.f.m.

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IN RE DAVID GOTTLIEB AND ALFRED AMMANN

No. 7103

United States Court of Customs and Patent Appeals

51 C.C.P.A. 1114; 328 F.2d 1016; 1964 CCPA LEXIS 447; 140 U.S.P.Q. (BNA) 665

Oral argument January 9, 1964
March 19, 1964

PRIOR HISTORY: [***1] APPEAL from Patent Office, Serial No. 471,811

DISPOSITION: Reversed.

COUNSEL: *George T. Johannesen (Eugene O. Retter, of counsel)* for appellants.

Clarence W. Moore (Raymond E. Martin, of counsel) for the Commissioner of Patents.

OPINION BY: ALMOND

OPINION

[**1017] [**1114] Before WORLEY, Chief Judge, and RICH, MARTIN, SMITH, and ALMOND, Jr., Associate Judges

ALMOND, Judge, delivered the opinion of the court:

Gottlieb and Ammann appeal from the decision of the Board of Appeals affirming the examiner's rejection of claims 7, 10, 12 and 14 through 17 of appellants' application ¹ for a "Chemical Compound." No claims have been allowed. The rejection was predicated on "lack of utility."

¹ Serial No. 471,811 filed November 29, 1954.

There is no issue here relating to the form or the substance of the appealed claims, thus obviating the necessity for their reproduction.

The claimed invention is for a new antibiotic called filipin, derived from a soil sample taken in the Philippine Islands, containing *Streptomyces filipinensis*. The antibiotic is allegedly "characterized by anti-fungal activity."

Claims 7 and 10 relate to the antibiotic compound and describe it in terms [***2] of its physical properties.

Claims 12 and 14 through 17 recite the process used to produce filipin.

The specification states:

Because of its low phyto toxicity, filipin is useful in the treatment of gray leaf spot in tomato plants caused by *Stemphylium solani*. The antibiotic is useful also in the treatment of other plant and fruit diseases caused by fungi which includes black mold in onion plants, corn leaf blight, collar rot in tomatoes, bitter rot in apples, tomato wilt, and the like. Further, its use in the treatment of skin and deep-seated infections is likewise indicated. Still further, because of its marked inhibition of *trichomonas foetus*, in concentrations as low as [**1115] one microgram per milliliter, its use in the treatment of abortion in cattle is likewise indicated.

It is apparent from this quotation that three separate areas of use are suggested: (1) as a plant fungicide; (2) for treatment of human "skin and deep-seated infections," and (3) for "treatment of abortion in cattle."

In the use of the antibiotic for treatment of the skin and deep-seated infections, it is stated that filipin may be combined with other antibiotics, antifungal agents, steroids, [***3] or other antibacterial or medicinal agents. The specification recites the results of tests showing the inhibitory effect of filipin against certain fungi as well as composition tests of the inhibitory effects of filipin and ethanol against certain fungi. It is noted that the tests were performed in vitro.

During the prosecution before the Patent Office, appellants referred to an article by M. L. Gattani ² showing tests of filipin against rootrotting fungi in vitro. These studies are said to prove the effectiveness of filipin as a plant fungicide. The examiner's only comment was "The tests on damping-off disease for safflower in Gattani's article * * * are obviously not convincing of all utilities alleged in the specification."

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2 "Studies on the Control of Damping-off of Safflower with Antibiotics" in Plant Disease Reporter, Vol. 4, No. 3.

In addition, an affidavit of Tucker was submitted concerning the use of filipin in the treatment of human infection in an effort to prove the utility of filipin in humans.

All grounds of rejection advanced by the examiner were reversed except the [**1018] rejection for lack of utility. In affirming this rejection, the board [***4] stated:

The appealed claims stand rejected for lack of utility in the absence of clear and convincing proof that the compositions are safe, effective and reliable for the purpose alleged. Appellants' specification states that the use of their antibiotics "in the treatment of skin and deep-seated infections is indicated." The specification states that it can be used in topical or oral preparations. Under the circumstances of this case we consider that the therapeutic utility has not been proven. We agree with the Examiner that the evidence submitted is insufficient. For the reasons that the Examiner has set forth the affidavit is not convincing to us of all the therapeutic utilities alleged in the specification. The Examiner points out that the affidavit is hearsay as it is not by the individuals doing the work. Further, the statistical results do not appear significant. The rejection of the appealed claims for lack of utility will be sustained.

On reconsideration, the board said:

Appellants urge that there is adequate disclosure of nonhuman utility at the bottom of page 13 of the specification. The Examiner, in his Answer, stated in regard to the rejection of the claims [***5] for lack of utility that appellants have failed to prove that filipin per se is an effective therapeutic in animals. We [*1116] affirmed this rejection. No showing was made as to proof of non-human therapeutic utility. Furthermore, the specification merely "indicates" that filipin may be useful for the purpose now relied on by appellants.

The evidence and the arguments concerning the alleged utilities "in the treatment of abortion in cattle" and in the treatment of human "skin and deep-seated infections" need not be analyzed in detail under the view we take of the case inasmuch as we consider the first branch of the case concerning utility as a plant fungicide to be dispositive.

It is appellants' contention that the disclosed utility for the control of fungal diseases of plants is sufficient for statutory utility and that no issue was raised below about this disclosure. They reason, therefore, that the real issue is the propriety of certain statements in the specification and not the patentability of the claims, and that the

cancellation or correction of the additional statements of utility is a matter for petition to the Commissioner rather than appeal to this court.

[***6] The solicitor maintains "that neither the examiner nor the Board conceded that filipin has been shown to be useful for any of the purposes alleged in the specification." He argues that the board's finding of lack of "proof of non-human therapeutic utility" refers to the allegation of utility as a plant pesticide as well as to the "indicated" utility in the treatment of abortion in cattle. The in vitro tests conducted by appellant and by Gattani were not sufficient, according to the solicitor, to prove that the product is useful, because there is "no assurance that an antibiotic is not toxic when used in vivo." Moreover, the Gattani studies do not provide adequate proof of effectiveness as a plant fungicide, because only specific fungi are discussed in the instant specification and Gattani did not treat these fungi, and the safflower involved in the Gattani tests finds no support in the specification.

[1] We are of the opinion that the disclosure of utility in treating a variety of fungi is sufficient to satisfy the statutory requirements of 35 U.S.C. 101. It does not appear from the abbreviated record before us that the utility as a plant fungicide was questioned below. The [***7] examiner apparently accepted the statements concerning plant fungi, but found them not sufficient to prove "all utilities alleged in the specification." The board affirmed without any detailed analysis or comment on the plant utility disclosure in the specification. Certainly no justification was given below for challenging [**1019] the alleged utility as a plant fungicide. The board's opinion, quoted supra, indicates a consideration only of the human aspects of the alleged utility, and appears to ignore the primary allegation of utility as a plant fungicide. Even on reconsideration, the board failed to mention the use as a plant fungicide. It seems unlikely that the words "non-human therapeutic utility" in the board's opinion are a reference to the utility [*1117] as a plant fungicide, particularly in view of the next sentence, which refers to the fact that the specification merely "indicates" utility "for the purpose now relied on." The specification states that utility in humans and animals is "indicated," but the allegation of utility against a variety of plant fungi is set forth without equivocation.

The solicitor relies heavily on the case of *In re Novak et al.*, [***8] 49 CCPA 1283, 306 F.2d 924, 134 USPQ 335. In that case the only utility alleged was in human beings. The Patent Office required proof of the alleged utility which appellants failed to provide. In the absence of proof of any utility, this court said:

In our opinion, when an applicant bases utility for a claimed invention on allegations of the sort made by

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appellants here, unless one with ordinary skill in the art would accept those allegations as obviously valid and correct, it is proper for the examiner to ask for evidence which substantiates them. Here we find no indication that one skilled in this art would accept without question statements that carboxymethyl dextran has the alleged effects on the functioning of any base, physiologically active or not, and no evidence has been presented to demonstrate that the claimed products do have those effects.

In the instant case, even if the proof of utility in human beings or animals is not adequate, there remains the alleged utility as a plant fungicide.

The allegation of utility as a plant fungicide would not normally appear "to be incredible in the light of the knowledge of the art, or factually misleading" in *re Citron*, 51 [***9] CCPA 852, 325 F.2d 248, 139 USPQ 516. Nevertheless, appellants have submitted evidence tending to prove the utility of filipin as a plant fungicide in the Gattani studies. The report of Gattani states:

It is evident that the application of filipin solution for 3 days effectively reduced damping-off of safflower.

Filipin, an antifungal agent, has been reported to be inhibitive against a wide variety of fungi and to give partial protection to tomato plants against *Stemphylium solani*. Our in vitro investigations show that filipin is inhibitive against *Helminthosporium sativum*, *Fusarium*

culmorum, *Phizoctonia solani*, *Phoma betae*, and *Phythium sp.* pathogenic to safflower.

We consider this evidence sufficient to prove that filipin is useful. The fact that the fungus causing damping-off of safflower is not specifically disclosed in appellants' specification does not detract from the efficacy of the article as proof that filipin is useful as a plant fungicide. Damping-off of safflower presumably falls within "other plant and fruit diseases caused by fungi" encompassed by the disclosure. We emphasize the fact that the issue here is whether the record shows the claimed antibiotic [***10] to be useful under 35 U.S.C. 101 and not whether superior or unexpected results were obtained bearing on an issue of patentability under section 103 of the statute. Having found that [*1118] the antibiotic is useful for some purpose, it becomes unnecessary to decide whether it is in fact useful for the other purposes "indicated" in the specification as possibly useful.

Appellants' argument seems to acknowledge that there may be a question as to the propriety of statements in their application concerning uses other than the control of fungal diseases. Our present holding is not to be construed as precluding the Patent Office from making such requirements as to correction or [**1020] cancellation of those statements as may be appropriate.

For the foregoing reasons, the decision of the board is reversed.

SMITH, J., concurs in the result.